SHOUT
SHARE
IT

LIBRARY OF THE NEW YORK BOTANICAL GARDEN

LIBRARY
NEW YORK
BOTANICAL
GARDEN

MEMOIRS

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME 10, NUMBER 1

The Botany of the Guayana Highland—Part III
BASSETT MAGUIRE AND JOHN J. WURDACK AND COLLABORATORS 1

Anatomy of Guayana Mutisieae. Part II .... SHERWIN CARLQUIST 157

Issued July 1, 1958

XM
.E572
Vol. 10
1958/64

The Memoirs of The New York Botanical Garden are issued at irregular intervals in parts of various sizes. Approximately 500 pages will complete a volume. The subscription price of volume 10 is $10.00. Number 1 may be purchased separately for $3.50. Authors of papers may obtain separate copies of their contributions, printed at the same time as the issue, at cost price.

For further information address the editor:

H. W. Rickett
The New York Botanical Garden
New York 58, N. Y.

ERRATA

MEMOIRS OF THE NEW YORK BOTANICAL GARDEN

Volume 10, Number 1
July 1, 1958

P. 2: in table for style of *Abolboda*, for "alcerately" read "lacerately"
P. 12, line 21: for "prevalance", read "prevalence"
P. 17, line 8: for "aciularis", read "acicularis"
P. 21, footnote: for "*Rapaeaceae*", read "*Rapateaceae*"
P. 22, line 9 of key: for "terte", read "terete"
P. 32, line 1: for "(US 1903798; Herb. Lehmannianum *s.n.* *s. dat.* K)", read "(US 1903798); Herb. Lehmannianum *s.n.* *s. dat.*(K)."
line 21: for "Sipopa", read "Sipapo"
line 35: for "peduncelo", read "pedunculo"
line 41: for "gratatis", read "gradatis"
P. 35, line 30: for "*Schoenocephaleae*", read "*Schoenocephalieae*"
P. 36, line 17: for "bivavlatis", read "bivalvatis"
line 36: for "aranged", read "arranged"
line 37: for "savana", read "savanna"
P. 37, first line of key: for "upply", read "upper"
P. 39, 2nd line from bottom: for "les", read "less"
P. 40, line 1: for "Mayo", read "Moyo"
line 41: for "subbassally", read "subbasally"
P. 43, line 47: for "lagoona", read "laguna"
line 49: for "dege", read "edge"
P. 48, line 45: for "Parophytum", read "Potarophytum"
P. 51, line 10: for "obvate", read "obovate"
line 24: for "numtrous", read "numerous"
P. 92, last line of key: for "3.5 mm", read "3.5 cm"
P. 95, last line: for "6-", read "6-9"
P. 97, line 4: for "Rhychanthera", read "Rhynchanthera"
line 6: for "*Rhyncanthera*", read "*Rhynchanthera*"
line 7: for "*Rhyncanthera*", read "*Rhynchanthera*"
P. 98, line 2: for "aerolata", read "areolata"
line 12: for "cordiforia", read "cordifolia"
P. 100, line 2: for "glabor", read "glaber"
P. 101, line 38: for "7-11 3-3.5", read "7-11 X 3-3.5"
P. 102, line 33: for "impersqicue", read "imperspicue"
P. 106, line 27: for "Schules", read "Schultes"
P. 108, line 22: for "2.6", read "2.6 mm"
P. 109, line 47: for "subus", read "subtus"
P. 115, line 24: for "apise", read "apice"
P. 120, line 19: for "denique", read "deinde"
P. 125, line 17: for "Ttate", read "Tate"
P. 129, line 9: for "Ttate", read "Tate"
P. 132, line 28: for "suggenus", read "subgenus"
line 38: for "3-6.5 mm", read "3-6.5 cm"

ERRATA
MEMOIRS OF THE NEW YORK BOTANICAL GARDEN
Volume 10, Number 1
July 1, 1958

P. 133, line 33: for "mor", read "more"
P. 134, line 24: for "tingled", read "tinged"
P. 135, line 6: after "Cano,", insert "2000 m alt., Jan 31, 1951, sparsely branched shrub to 1.5 m tall, flowers yellow with tube reddish basally. *Cowan & Wurdack 31144*, Serrania Paru, Rio Paru, Caño Asisa, Rio Ventuari, frequent, cumbre just south of head of valley of Camp Caño,"
    line 15: delete line and insert "portion) is up to 1.4 cm long, the throat 1.7 cm long, the corolla-lobes 1 cm long."
P. 137, line 5: for "rugolose", read "rugulose"
    line 37: for "acutifilia", read "acutifolia"
P. 143, line 31: for "pattren", read "pattern"
P. 144, line 32: for "collections, there", read "collections; there"
P. 160, plate explanation: for "*Wurdack 565*", read "*Steyermark & Wurdack 565*"
P. 162, line 33: for "intrepretation", read "interpretation"
P. 164, line 15: for "is", read "are"
P. 166, line 23: for "ontogny", read "ontogeny"
P. 168, line 48: for "palidsade", read "palisade"
P. 169, last line of legend: for "portiton", read "portion"
P. 179, line 14: for "*martianus*", read "*martiana*"

Vol. 10, No. 1 · MEMOIRS OF THE NEW YORK BOTANICAL GARDEN July 1, 1958

THE BOTANY OF THE GUAYANA HIGHLAND—PART III

Bassett Maguire and John J. Wurdack
and Collaborators

INTRODUCTION

In Part III we continue to report on plant collections made in South American Guayana. No additional field work has been done since the preparation of Part II* of this series. However, at this writing we are making ready for imminent return to the region of the Casiquiare, and the Ríos Pacimoni and Yatua in Amazonian Venezuela. There we are again to visit Cerro de la Neblina and the immediately outlying tabular mountains, all of the Roraima sedimentary complex. This, the nineteenth of our Guayana expeditions, is expected to be in the field for some six months. Field work and publication continue with the assistance of the National Science Foundation.

Of the studies presented herein, those of the *Xyridaceae, Rapateaceae*, and *Guttiferae* have been made by Maguire, and of the *Melastomataceae* by Wurdack. Contributions of collaborators are as follows: *Leguminosae* and *Rutaceae*, Richard S. Cowan; *Myrtaceae*, Rogers McVaugh; *Combretaceae*, B. Maguire and A. W. Exell; *Apocynaceae*, Joseph Monachino; and *Bignoniaceae*, N. Y. Sandwith. Sherwin Carlquist presents Part II of the "Anatomy of Guayana Mutisieae."

Illustrations have been prepared by Charles C. Clare, Alexis Khoury, Walter L. Graham, and Richard S. Cowan.

XYRIDACEAE

Traditionally, two genera have been recognized as constituting the small family *Xyridaceae: Xyris* with numerous species widely distributed in the Western Hemisphere, Europe, Africa, and Australia, and *Abolboda* with comparatively few species confined to tropical South America (exclusive of Andea). Both have been recognized as homogeneous genera except for the anomalous *Abolboda sceptrum*, for which until recently there has been insufficient material for adequate diagnosis.

Im Thurn on his Roraima expedition (1884–1885) collected the upper portion of a single flowering scape. Upon this specimen Oliver established the name *Abolboda sceptrum*.[1] Later, McConnell and Quelch[2] (1894, 1898) succeeded in collecting only adult leaves and young plants. Apparently the plant was not again collected until Tate in 1928 obtained single specimens of flowering and fruiting plants from Cerro Duida.[3] Of these specimens, Malme, prominent student of the *Xyridaceae* who reviewed Tate's material, wrote, in part, "forsitan novum genus sistat."

Subsequently, no fewer than 26 collections of *A. sceptrum* and its segregates have been made. Ample opportunity has been had to study the several populations in the field. It has now become abundantly demonstrable that the plants known as *A. sceptrum* must be referred to a distinct genus, for which I propose the name *Orectanthe* (descriptive of the porrect flowers).

On palynological evidence, Erdtman[4] has suggested that *Abolboda* and *Xyris*

---

*The botany of the Guayana Highland—Part II. Mem. N. Y. Bot. Gard. **9**: 235–392. 1957.

[1] Trans. Linn. Soc. II. Bot. **2**: 286. 1887.

[2] Trans. Linn Soc. II. Bot. **6**: 69. 1901.

[3] Bull. Torrey Club **58**: 326. 1931.

[4] *Pollen morphology and taxonomy* 453, 454. 1952.

are familially inconsonant. Taxonomic evidence supports this suggestion.† Additional morphologic data are now being sought further to elucidate the question.

The following table indicates the more obvious contrastive and comparative features of the three genera which are at this time tentatively retained in the *Xyridaceae.*

	Orectanthe	*Abolboda*	*Xyris*
1. Habit.	caulescent.	acaulescent.	acaulescent.
2. Leaf arrangement.	rosulate or cauline.	basal, sometimes rosulate, in at least one species distichous and equitant.	basal, often distichous and the sheaths strongly equitant.
3. Scape	ebracteate.	bracteate (commonly).	ebracteate.
4. Sepals.	3.	2 (commonly).	3.
5. Corolla.	irregular, yellow.	regular, or somewhat irregular, blue, rarely white.	regular, yellow, rarely white.
6. Staminodia.	lacking.	lacking, or simple and filiform.	bifurcate, strongly penicillate.
7. Pollen grains.	nonaperturate, spheroidal, spinose, 160–250 μ in diameter.	nonaperturate, spheroidal, spinose, 75–150 μ in diameter.	aperturate, sulcate, without spines.
8. Style.	crateriform, penicillate, undivided.	crateriform, penicillate, sometimes alcerately trifid.	trifid above the middle, the segments linear.
9. Seed.	strongly compressed, broadly winged, nonstriate; mitten-shaped.	obliquely oblong, obliquely striate.	oblong, vertically striate.

Key to the Genera of the Xyridaceae

1. Sepals 3; flowers yellow.
   2. Corollas irregular, porrectate, exceeding 5 cm in length; staminodia lacking; seed strongly compressed, broadly winged; coarse caulescent herbs with rosulate or conferted cauline leaves. 1. *Orectanthe.*
   2. Corollas regular, less than 3 cm long; staminodia bifurcate, prominently penicillate; seed oblong, vertically striate; acaulescent herbs with basal and often distichous but not rosulate leaves. 3. *Xyris.*
1. Sepals 2 (commonly); corollas blue, essentially regular, 3 cm or less long; staminodia lacking or filiform and unbranched; seed obliquely oblong, spirally striate; acaulescent herb with basal, rosulate, or sometimes distichous leaves 2. *Abolboda.*

1. **Orectanthe** Maguire, gen. nov.

Inflorescentia solitaria, terminalis capitata subglobosa, vel hemisphaerica amplior, multiflora; floribus sessilibus porrectis singulis a bractea subtentis; bractearum cyclo vel duobus inferioribus sterilibus; floribus trimeris; sepalis 3, duobus lateralibus conduplicatis equitantibus valde carinatis falcate lanceolatis, tertio anteriore nec conduplicato nec carinato; corolla gamopetala aliquantum inaequaliter bilateraliter symmetricali porrecta, lobo posteriore maiore; staminibus 3, antheris adnatis linearibus 4-locularibus; granis pollinis maximis, 160–

---

† Mr. A. A. Bullock has brought to our attention the formal and valid publication of the name of Abolbodaceae Nakai, in Ordines, familiae, tribi, [etc.] in praelectionibus anni 1937.

250 μ diam., sphaeroideis, non aperturatis spinosis; ovario 3-loculari, placentis 6, axialibus 2–3-seriatis; stylo simplici ad basim a 3 valde recurvatis simplicibus appendicibus subtento; stigmate oblique terminali aliquantum fimbriato crateriformi; seminibus valde compressis, late alatis, oblongis irregulariter mitriformibus; embryone recto.

Herbae perennes caulescentes; laminis lineari-lanceolatis acute acutis, rosulatis vel confertis. Typus: *Orectanthe sceptrum* (Oliver) Maguire.

Orectanthe from ὀρεκτός, stretched outward, ἄνθος, flower; because of the porrectate flowers.

Key to the Species of *Orectanthe*

Plants essentially acaulescent, the stem 1 dm or less long; leaves densely rosulate; usually unipedunculate; cephalar bracts commonly 3 in a single cycle. 1. *Orectanthe sceptrum.*
Plants caulescent, the stems 4–15 dm long; leaves conferted but not rosulate; often pluripedunculate; cephalar bracts commonly 6 in 2 cycles. 2. *Orectanthe ptaritepuiana.*

1. Orectanthe sceptrum (Oliver) Maguire, comb. nov. Figure 1.

Caudex short; leaves numerous, stiffly rosulate, linear-lanceolate (1.2) 1.5–4.5 cm wide, (10) 15–30 cm long, conspicuously brown-margined, the base broad and more or less clasping, the apex pungently acute or acuminate; scapes terete, usually solitary, 3–12 dm high, subtended at the base by 2 or 3 lanceolate bracts 2–8 cm long; heads ovate before anthesis, enclosed by 3 (2) ovate to lanceolate sterile bracts, at maturity globose-hemispheric, the flowers porrect, each subtended by an ovate-lanceolate bract shorter than the sepals; sepals 3, the lateral keeled pair 5–7 cm long, the anterior sepal not keeled and somewhat shorter; corolla yellow (5) 6–8 cm long, the tube ± equaling the lobes; style shorter than the corolla; capsule obovate-obpyriform, 3-celled, loculicidal, 1.5–2.0 cm long; seed compressed, winged, orbicular or oblong, irregular, mitten-shaped, (3.5) 4–5 mm long.

Key to the Subspecies of *Orectanthe sceptrum*

Subtending cephalar bracts lanceolate, 3–5 cm long; herbage glaucous. subsp. *sceptrum.*
Subtending cephalar bracts ovate, 1.5–2.0 cm long; herbage not glaucous. subsp. *occidentalis.*

Orectanthe sceptrum subsp. **sceptrum.**

Abolboda sceptrum Oliver, Trans. Linn. Soc. II. Bot. 2: 286. 1887.

Plants ordinarily 1.0–1.5 m high; herbage glaucous; cephalar bracts lanceolate to ovate-lanceolate, 3–5 cm long, very acute or merely acutish.

Type: "Roraima summit," *im Thurn 312* (K). The type consists wholly of a single ". . . well developed capitulum and 8–9 inches of its scape."

Distribution: plants of open marshy or boggy areas, and wet savannas, British Guiana Pakaraima Mountains and the Gran Sabana, Venezuela, at 500 m upwards to cumbre summits at more than 2000 m altitude.

Specimens examined: BRITISH GUIANA: Pakaraima Mountains: perennial herb with solitary scape and basal rosette of linear-lanceolate, brown-margined leaves, occasional in marshy area, Imbaimadai Savannas, Upper Mazaruni River, at 550 m altitude, Oct 24, 1951, *Maguire & Fanshawe 32254;* acaulescent marsh herb, scape 1 m high, flowers pale yellow, savannas 15 km. n. Mt. Ayanganna, at 1200 m altitude, Feb. 2, 1955, *Maguire, Bagshaw & Maguire 40567.* VENEZUELA: Gran Sabana, Edo. Bolívar: "Roraima summit," *E. F. im Thurn 312* (holotype, K); Emerald Swamp, southwest-facing slope at 1520 m alt., Sept 25, 1944, *Steyermark 58615* (NY, F); summit Mt. Roraima at 2620–2740 m alt., Sept 27, 1944, *Steyermark 58861* (F); frequent, marshy savanna, between San Rafael and Enemasic,

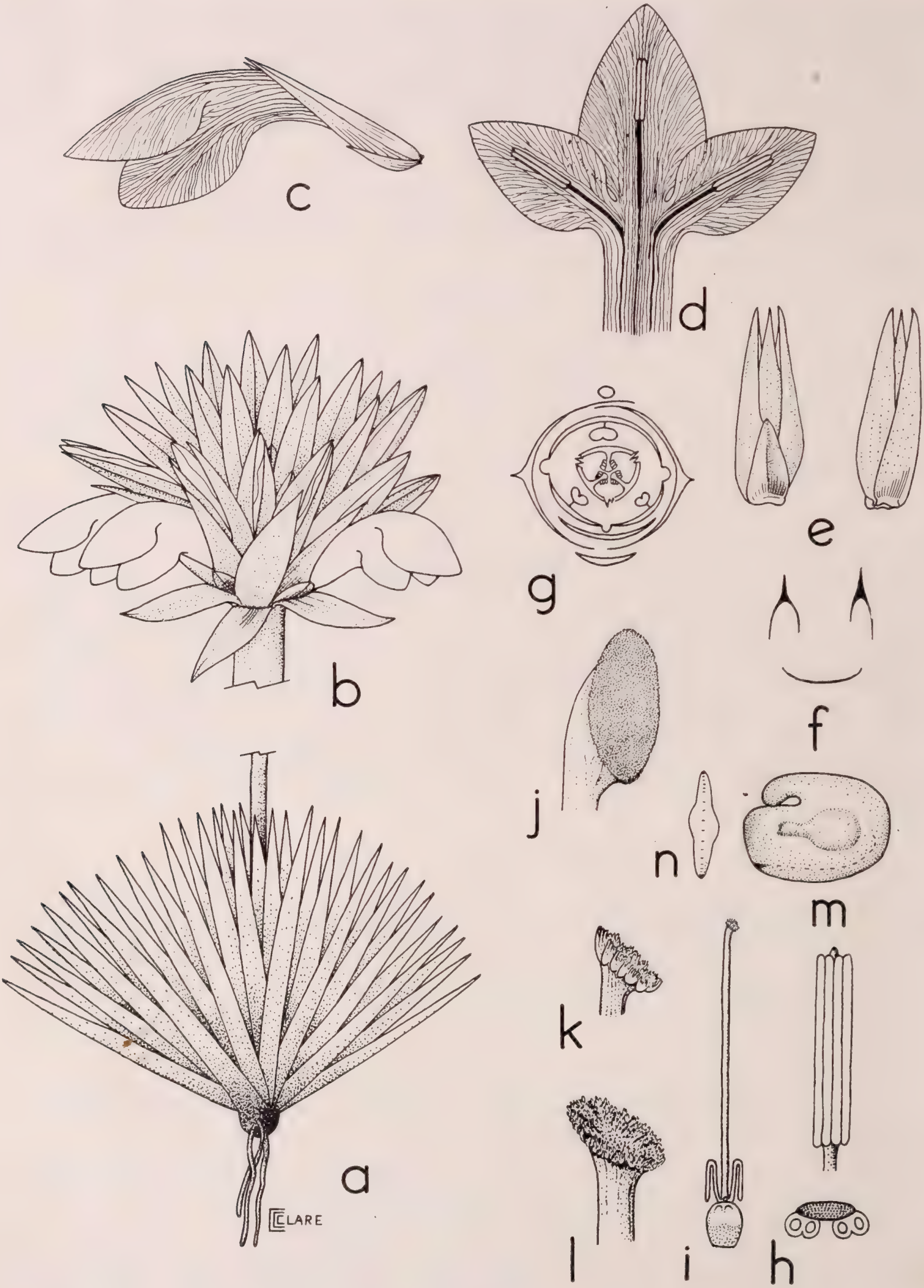


FIG. 1. a–n, *Orectanthe sceptrum.* a, habit, × 1/6; b, inflorescence, × ½; c, flower in natural posture, × ½; d, corolla spread out, × ½; e, sepals, anterior view showing subtending bract, posterior view, ×½; f, diagrammatic representation of cross-section of keeled lateral sepals, and concave inner sepal, × 1; g, cross diagram of flower; h, ventral view, × 2, and cross section, × 4, of anther; i, pistil, × ½; j, k, l, stages in developing stigma, × 4; m, face view, and n, cross section of seed, × 5; drawn from *Maguire 33180.*

ca. 12 km w. Ilu-tepuí at 1200 m alt., Feb 15, 1952, *Maguire 31180;* marshy places in open savanna, Mesa Grande, Ilu-tepuí, at 1600 m alt., Mar 12, 1952, *Maguire 33342;* Ptari-tepuí, sw-facing shoulder, Nov 2, 1944. *Steyermark 59787(F);* Ptari-tepuí at 1615 m alt., Nov 15–17, 1944, *Steyermark 60244* (F); Kavanayén, May 28, 1956, *Lasser 1826* (NY); Kavanayén at 1300 m alt., Mar 30, 1952, *Maguire 33680.*

Orectanthe sceptrum subsp. **occidentalis** Maguire, subsp. nov.

Plantae vulgo 5–10 dm altae; gemmis axillaribus frequentibus; non glaucis; bracteis cephalaribus ovatis vel lanceolato-ovatis, 1.5–2.0 cm longis, acutiusculis.

Type: scapose perennial herb 1 m high, scapes reddish, frequent in marshy scrub savanna, Southeast Escarpment at 1900 m alt., Cerro Huachamacari, Terr. Amazonas, Venezuela, December 11, 1950, *Maguire, Cowan & Wurdack 30140* (NY).

Paratypes: VENEZUELA: Amazonas: Cerro Sipapo: wet ledges, West Peak at 1800 m, Dec 20, 1948, *Maguire & Politi 27777;* savanna bog, Lower Caño Negro, at 1400 m alt., Jan 1, 1949, *Maguire & Politi 28106;* Upper East Basin at 1900 m, Jan 14, 1949, *Maguire & Politi 28451;* marshy area, North Mountain at 1500 m alt., Jan 25, 1949, *Maguire & Politi 28569;* savanna, South Escarpment at 2100 m alt., Jan 26-28, 1949, *Maguire, Politi & Maguire 28645;* savanna, South Basin at 2000 m alt., Jan 26-28, 1949, *Maguire, Politi & Maguire 28678.* Summit Mt. Duida: at 6300 ft. alt., Nov 26, 1928, *Tate 398.* Cerro Huachamacari: savanna at 1700 m alt., Dec 4, 1950, *Maguire, Cowan & Wurdack 29822;* summit East Ridge at 1820 m alt., Dec 8, 1950, *Maguire, Cowan & Wurdack 30039;* Escarpment Ridge 1800 m alt., Dec 14, 1950, *Maguire, Cowan & Wurdack 30213.* West Escarpment, Cerro de la Neblina at 1750 m alt., Jan 15, 1954, *Maguire, Wurdack & Bunting. 37303.*

Distribution: marshy areas and wet savannas, cumbres of the sandstone massifs of Venezuelan Amazonas. Specimens from Cerro Sipapo are usually smaller than those from elsewhere and commonly develop offshoots from some of the leaf-axils, and thus seem to represent a distinct minor variant.

2. **Orectanthe ptaritepuiana** (Steyermark) Maguire, comb. nov.

Abolboda ptaritepuiana Steyermark, Fieldiana Bot. **28:** 104. 1951.

Caulescent perennial herb; herbage not glaucous; stems 0.5–2.0 m tall; leaves numerous, rather laxly conferted but not rosulate, linear-lanceolate, obviously or not at all brown-margined, pungently acute, 15–30 cm long, 1–5 cm broad; peduncles more often several (solitary in the type): sterile bracts in 2 whorls of 3's; inflorescence and flowers otherwise similar to those of *O. sceptrum.*

Type: in dense thickets and *Bonnetia roraimae* forest southwest facing shoulder, Ptari-tepuí, Edo. Bolívar, Venezuela, Nov 2, 1944, *Steyermark 59760.*

Distribution: at higher elevations, 1500–2000 m alt., on Roraima Sediments, Edo. Bolívar, Venezuela.

Specimens examined: VENEZUELA: Bolívar: Ptari-tepuí, *Steyermark 59760* (holotype F, 2 sheets). Cerro Guaiquinima: coarse perennial herb dying on flowering; bracts 4–5, open savannas 1 km south of Cumbre Camp at 1800 m alt., Dec 29, 1951, *Maguire 32823;* young plants with a single scape, mature plants with 3-6 scapes, primary cephalar bracts of two whorls of 3's, marshes and *Brocchinia* thickets 1 km e of Cumbre Camp at 1800 m, *Maguire 32786;* marsh-bog herb, peduncles as many as 10, North Valley at 16–1700 m alt., Jan 4, 1952, *Maguire 32979;* valley below se Escarpment at 16–1700 m alt., Jan 7, 1952, *Maguire 33022;* marsh-bog, sometimes with branched stem, peduncles (1) 3–10, Cumbre Camp at 1800 m alt., Jan 9, 1952, *Maguire 33035.* Gran Sabana: perennial herb, stems 1 m high, leafy, scapes 5, heads subnectant, scrub type associated with *Brocchinia* at 2400–2500 m alt., Ilu-tepuí, March 17, 1952, *Maguire 33467;* herbaceous perennial, abundant in large colonies, escarpment face and talus, Sarvén-tepuí, Chimantá-tepuí, at 1900–2050 m alt., Jan 13, 1953, *Wurdack 34134-A;* herbaceous with elongated erect leafy stems up to 10 feet tall, elfin formation Apácara-tepuí, Chimantá-tepuí, June 19, 1953, *Steyermark 75698* (F, 3 sheets, NY); stems erect, 3–8 ft. tall, Apácara-tepuí, *Steyermark 75885* (F, 2 sheets, NY, 2 sheets); herb with leafy stem, scapes 1–5, common, bogs at 2200 m alt., Serra do Sol (Uei-tepuí), *Maguire & Maguire 40413;* Chimantá-tepuí, 1955, *Steyermark and Wurdack 523, 905, 1221.*

Orectanthe ptaritepuiana is distinguished from *O. sceptrum* largely by means of vegetative differences, and to some extent on geographical grounds. The first is characterized by well developed leafy stems and the prevalence of 3 or more peduncles, as contrasted to *O. sceptrum* which has very short stems and densely rosulate leaves. Although variable in size and trivial detail, there seems to be no way conclusively to separate the two species by floral distinction. They both occupy the geographical range in eastern Guayana, but only *O. sceptrum* is to be found in western Venezuelan Guayana. Both species inhabit upper cumbre habitats; only *O. sceptrum* occurs also at low altitude (1000 m) on the Gran Sabana.

2. **Abolboda** Kunth in Humb. & Bonpl. Pl. Aequin. **2:** 25, 109. *pl. 114.* 1809.

Key to the Species of *Abolboda*

1. Scapes provided with 1 or more pairs of subopposite bracts (exclusive of basally subtending members.

2. Scapes commonly with 2 (occasionally 3 or 4) pairs of bracts, or sometimes with only one pair, then exceeding 3 dm in height; herbs normally 3 dm or more high.

3. Spikes simple, not glomerate.

4. Scapes simple, with a single terminal spike.

5. Spikes globose or ovoid, the paired sepals and subtending bracts outwardly arched or divergent at maturity, bracts ½ or less as long as the sepals. 1. *A. grandis.*

5. Spikes cylindric or elliptic-cylindric; the paired and subtending bracts ascending or strict at maturity; bracts more or less equaling, or at least more than ½ the length of the sepals. 2. *A. macrostachya.*

4. Scapes branched, or if simple, with 1 or 2 axillary spikes below the terminal.

6. Scapes paniculate; spikelets 2–4-flowered, solitary and terminal on each branch; leaves numerous, densely rosulate, gramineous, 5–10 mm long, 1.5–3.0 mm broad, narrowly acute, mucronate. 3. *A. paniculata.*

6. Scapes simple; spikelets 1-flowered, terminal, and in addition axillary spikelets from the penultimate or antipenultimate vaginal bracts; leaves numerous, densely rosulate, narrowly linear, triquetrous, obtuse, abruptly mucronulate, 2–3 cm long, ca. 1 mm broad. 4. *A. uniflora.*

3. Spikes glomerate; Río Guainía drainage, Venezuela (and Colombia). 5. *A. glomerata.*

2. Scapes commonly with a single pair of bracts.

7. Spikes cylindric or subcylindric, exceeding 2 cm in length; leaves linear, obtuse, 20–30 cm long, considerably exceeding ½ the length of the scapes; upper Río Orinoco and Río Guainía drainages. 6. *A. linearifolia.*

7. Spikes ovate or elliptic, 1.5 cm or less long.

8. Leaves commonly ½ or more the length of the scapes.

9. Bracts immediately subtending and much exceeding the spike; spikes ovate, 1.0–1.5 cm long; sepals and subtending bracts ascending or strict; leaves pseudo-equitant, gramineous, acute, 10–30 cm long, more or less equaling the scapes. 7. *A. sprucei.*

9. Bracts not immediately subtending the heads, affixed at more or less the middle of the scape; flowers and subtending bracts arcuate or subdivaricate.

10. Bracts of the scape narrowly lanceolate, attenuately acuminate, 2.0–2.5 cm long; cephalar bracts strongly productate; sepals 16–20 mm long; plants 10–15 cm high; Yapacana Savannas, Amazonas, Venezuela. 8. *A. bella.*

10. Bracts of scapes lanceolate, abruptly acute, mucronulate, 1.0–1.2 cm long; cephalar bracts ovate-lanceolate, ca. 7–8 mm long, short-productate; sepals 9–10 mm long; plants 6–8 cm high; campos do Ariramba, Rio Trombetas, Pará, Brazil. 9. *A. abbreviata.*

8. Leaves commonly ¼ or less the length of the scape.

11. Leaves plane, or more than 1 mm broad.

12. Leaves entire; bracts of the scape 1.0–3.5 cm long.

13. Flowers 5 or more per spike; bracts of the scape 2.5–3.5 cm long, the first cephalar bracts 7–9 mm long, acute, mucronulate; campos and chapadas, Matto Grosso, Minas Gerais, Goyaz, southern Pará, Brazil. 10. *A. poarchon.*

13. Flowers commonly 2–4 per spike; bracts of the scape 1.0–1.5 (2.0) cm long, the first cephalar bracts 8–12 mm long, acutish, bluntly short-productate; savannas and campos, range of the preceeding, and Amazonas, Brazil; Vaupés, Colombia; and Amazonas and Bolívar, Venezuela. 11. *A. pulchella.*

12. Leaves serrulate-ciliate; bracts of the scapes 4.0 cm long; cumbre of Cerro Neblina, Amazonas, Venezuela. 13. *A. ciliata.*

11. Leaves acicular, subulate or triquetrous, 0.5–0.8 mm wide; lower cephalar bracts exceeding the spike; savannas, drainage of the Ríos Atabapo and Guainía, Colombia and Venezuela. 12. *A. acicularis.*

1. Scapes naked, without bracts (except the subtending basal ones), or scapes lacking.

14. Plants with an evident scape.

15. Plants strongly perennial with an obvious rhizome; scapes relatively coarse, 12–18 cm high, ca. 1 mm in diameter; outer cephalar bracts 10–15 mm long, conspicuously and bluntly productate, commonly exceeding the spike; spike 3–4-flowered, 10–12 mm high; Yapacana Savannas, Amazonas, Venezuela. 14. *A. ebracteata.*

15. Plants weakly perennial; scapes 2–12 cm high, 0.5–0.8 mm in diameter; outer cephalar bracts 5–8 mm long, subhyaline, acute or obtusish, commonly shorter than the spike; spike 2–6-flowered, 5–8 mm high; Kaieteur Savannas and low altitude areas, Atlantic Coast from British Guiana to Brazil; the upper Orinoco, and Río Negro, Venezuela, Colombia, and Brazil. 15. *A. americana.*

14. Plants escapose.

16. Leaves strongly nodulose, triquetrous, 0.8 mm broad, obtuse, commonly with a short mucro, essentially nerveless; capsule acute, glabrous; west sandy flats or savannas at low altitudes, Suriname, British Guiana, lower Río Paragua (Orinoco) drainage, Venezuela. 16. *A. killipii.*

16. Leaves not at all nodulose, plane, 1–2 (4.5) mm broad, very acute, conspicuously aristate, often strongly nerved; capsule obtuse, apically papillose; higher altitudes on Roraima Sediments, Guayana. 17. *A. acaulis.*

1. **Abolboda grandis** Griseb.

As indicated by the following key, *A. grandis* is an exceedingly variable species, the three recognized minor variants being populations that are largely the expression of size and vigor from which one variety passes into another. Geographical and ecological arrangement, with the obviously implied genetic considerations, lend persuasion that at least three infraspecific populations be given taxonomic place.

Key to the Varieties of *Abolboda grandis*

1. Leaves usually (12)15–25, (8)10–15(20) cm long, (5)8–15(18) mm broad; scapes 2–several, 2.0–5.0(6.0) dm high, the bracts commonly 2 pairs, rarely 3; inflorescence depressed-globose, 15–18(20) mm high; sepals 15–18 mm long; at low altitudes, Coastal Guiana; lower Amazon and Río Negro Basins. var. *grandis.*

1. Leaves usually 10–20, 20–50 cm long, 15–20 mm broad; scapes 1–several, 5–10 dm high, commonly with 3 or 4, rarely 2 pairs of bracts; spike ovoid or subglobose, 20–25 mm high; sepals 12–16 mm long; at high altitudes on sandstone sediments of Guayana. var. *guayanensis.*

1. Leaves usually 10–20(25), 20–50 cm long, 10–15(18) mm broad; scapes 2–several, 6–15(20) dm high commonly with 2–4 pairs of bracts, spikes ovoid, subglobose, or oblong-globose, 25–40 mm high; sepals 15–20 mm long; at high altitudes, on sandstone sediments in Venezuelan Amazonas. var. *rigida.*

Abolboda grandis var. **grandis.**

Abolboda grandis Griseb. Linnaea **21**: 281. 1848.

Abolboda grandis var. *minor* Spruce ex Malme, Bih. Sv. Vet.-Akad. Handl. **26**: (Afd. III. No. 19):14. 1901.

Type: "In arenosis prope Joden-Savanna (Cordonpad), fl. Novembri Hb. Keg[el]. n. 1131." Suriname.

Specimens examined: SURINAME: Geijskes Creek, Coppename River Headwaters, *Maguire 24176* (F, NY); Tafelberg, *Maguire 24215.* BRITISH GUIANA: Rupununi Cattle Trail, *Abraham 301* (NY); Kaieteur Savanna, *Jenman 1020* (NY). VENEZUELA: Territorio Amazonas: Yavita: *Maguire 29277* (NY), a robust specimen with characters of var. *guayanensis; Williams 13910* (F), *13931* (F), both robust specimens. Maroa: *Williams 16140* (F); *Maguire & Wurdack 35687* (NY), *36424* (NY). COLOMBIA: Vaupés: *García-Barriga 14277* (COL), *14334* (COL), *15021* (COL), *15038* (COL); *Schultes 18386* (COL); *Schultes & Cabrera 13179* (COL), *17555* (COL), *19722* (COL), *19645* (COL), *19687* (COL), *19754* (COL); *Schultes, Baker & Cabrera 18009* (COL). BRAZIL: Amazonas, Manáos (Barra): *Guedes 12* (COL); *Killip & Smith 30164* (NY); *Spruce 1654* (NY), isotype of *A. grandis* var. *minor* Spruce ex Malme.

Lanjouw[5] has presented evidence to show that a third inner membranous sepal is present in flowers studied by him, of *Abolboda grandis,* presumably collected in coastal Suriname savannas. A year and a half later,[6] he restates his original proposition.

I have examined with some care young flowers (pre-anthesis) in some 20 sheets of *A. grandis,* but have found the third sepal present only in one—and that specimen from Suriname. It is suggested that the third sepal is not characteristic for the species as a whole, but may be found in local Suriname populations.

Abolboda grandis var. **guayanensis** Maguire, var. nov.

Folia vulgo 10–20, 20–50 cm longa, 15–20 mm lata; scapis 1–5, 5–10 dm altis, vulgo cum 3–4, rare 2 jugis vaginorum; spicis ovoideis vel subglobosis, 20–25 mm longis, 10–15-floris; sepalis 2, inaequilateralibus, aliquantum recurvatis, acutis, valde carinatis, 12–16 mm longis; bracteis omnibus fertilibus, ecarinatis, quam sepalis brevioribus; corollis ca. 2.5 cm longis, aliquantum irregularibus; antheris ca. 4 mm longis, sagittatis; ovariis elliptico-oblongis; stylis ca. 15 mm longis, trigonis, acute angulatis; appendicibus 2, clavatis, reflexis, simplicibus, ca. 3 mm longis; stigmatibus 3-partitis, partibus 2.5 mm longis, fimbriatis; capsulis elliptico-compressis, ca. 8 mm longis; seminibus ca. 1.2 mm longis, oblique obovatis, fere 12–14-costatis.

Type: leaves rather soft, in hummocks, flowers ephemeral, blue, frequent, open savannas, Campo Grande, Cerro Sipapo at 1500 m alt., Dec 8, 1948, Terr. Amazonas, Venezuela, *Maguire & Politi 27561.*

Paratypes: BRITISH GUIANA: Pakaraima Mountains: Kaieteur Savanna, *Hollister* in 1936 (NY); *Maguire & Fanshawe 23148* (NY, F), very similar to the type; Membaru Creek, *Pinkus 223;* Imbaimadai Savannas, *Maguire & Fanshawe 32192.* VENEZUELA: Amazonas: Cerro Sipapo, *Maguire & Politi 27497; 27561* (holotype NY, isotype NY); *28206; 28218; 28354; 28702* (intermediate to var. rigida). Cerro Duida, *Maguire, Cowan & Wurdack 29623;* Cerro Guanay, *Maguire, Phelps, Hitchcock, & Budowski 31702.*

Abolboda grandis var. **rigida** Malme, Bull. Torrey Club **58:** 326. 1931.

Abolboda pervaginata Malme, Ark. Bot. **25A**^{12}: 16. 1933.
Abolboda rigida (Malme) Steyermark, Fieldiana Bot. **28:** 105. 1951.
Not *A. rigida* Gleason.

Type: Brocchinia Hills, summit of Mount Duida, Terr. Amazonas, Venezuela, at 4500 ft alt., Jan 4, 1929. *G. H. H. Tate 586* (holotype NY, photo NY, F).

---

[5] Rec. Trav. Bot. Néerl. **34:** 492. 1937.

[6] Meded. Mus. Herb. Univ. Utrecht **53:** 4. 1939.

Specimens examined: VENEZUELA: Amazonas: Duida, *Tate 1041* (NY); *Steyermark 58181* (F, NY); Cerro Parú at 2000 m alt., *Cowan & Wurdack 31146* (NY). BRAZIL: Campos de Ariramba (in regione medii fluminis Trombetas), in uliginosis frequentissime, Dec 4, 1910, *Ducke 18967* (holotype S, photo NY, isotype P, photo NY, *A. pervaginata* Malme).

Malme (l.c.) wrote of *A. pervaginata,* "*A. grandis* Griseb., cui quoad folia similis, peraffinis. Differt praecipue scapo multo altiore et paribus quatuor vaginarum instructo." The collection from Cerro Parú, *Cowan & Wurdack 31146,* cited above, has scapes provided with 3–5 pairs of bracts, and exceeds in height those of *Ducke 18967.*

2. **Abolboda macrostachya** Spruce ex Malme, Bih. Sv. Vet.-Akad. Handl. **26** (Afd. 3. No. 19): 15. 1901.

This, like *A. grandis,* is an exceedingly variable species. The ranges of the two are almost coincident, except that the first, *A. macrostachya,* is not now known to occur in the lowland Atlantic drainage region of Guiana. Three minor infraspecific populations within *A. macrostachya* (as within *A. grandis*), have evolved, two of them previously recognized, and a third which occurs locally in the upper Orinoco and Río Guainía drainages, is herein proposed as new.

Sussenguth and Beyerle[7] report a third sepal for specimens (or a specimen) examined by themselves. In the review of 48 sheets, I have not been able to demonstrate the presence of a third sepal, and therefore must conclude that it is of exceedingly rare occurrence, and (as also for *A. grandis*) cannot be considered as characteristic.

In the examination of numerous unopened flower-buds, there has been detected the prevalence of three filiform staminodia, which are alternate with the stamens and attached at the base of the corolla-tube.

Key to the Varieties of *A. macrostachya*

1. Scapes usually several (3–5), 3.0–5.0 dm high, with 2 or sometimes 1 pair of bracts (excluding basal bracts).
    2. Leaves 10–18 mm broad, commonly 15 cm or less long, sometimes as much as 40 cm long; spikes about 8–10 mm in diameter; low-altitude savannas, drainage of the upper Orinoco and Río Negro. var. *macrostachya.*
    2. Leaves 3–5 mm broad, commonly 15–30 cm long; spike slender, 5–6 mm in diameter; locally confined to marshy savannas, upper Orinoco and Guainía drainages. var. *angustior.*
1. Scapes usually solitary, 5.0–8.0 dm high, commonly with but 1 pair of bracts (excluding basal bracts); leaves usually 10–25 mm wide, 30–45 cm long; plants of sandstone of Guayana. var. *robustior.*

Abolboda macrostachya var. **macrostachya.**

A. macrostachya Spruce ex Malme, Bih. Sv. Vet.-Akad. Handl. **26.** (Afd. 3. No. 19): 15. 1901.

Type: prope Esmeralda, ad flumen Orinoco, Dec 1853, *Spruce 3229.*

Specimens examined: VENEZUELA: Amazonas: savanna near Base Camp, Cerro Sipapo, at 130 m alt., *Maguire & Politi 27957, 28043, 28069;* Yapacana Savanna III, *Maguire, Cowan & Wurdack 30467, 30888;* Cerro Moriche, *Maguire, Cowan & Wurdack 30928, 30990;* Esmeralda Savanna, *Spruce 3229* (holotype S, isotypes NY, F), *Tate 244, Steyermark 57838* (F, NY), *Maguire & Wurdack 34697.* COLOMBIA: Vaupés: Savanna de Yapobodá, *Allen 3205* (COL); Kañeñdá, *García-Barriga 15055* (COL), *15061* (COL); Yapobodá, *Schultes 18494* (COL), *20053* (COL); Kañendá, *Schultes & Cabrera 1836* (COL); Pichuna, *Schultes & Cabrera 19905* (COL); savanna west of Cacagual, Río Atabapo, *Maguire, Wurdack & Bunting 36287;* Río Caquetá, Araracuara, *García-Barriga & Schultes 14162* (COL).

---

[7] Bot. Jahrb. **67**: 134. 1935.

Abolboda macrostachya var. **angustior** Maguire, var. nov. Figure 3.

Folia angustissima, 10–30 cm longa, 2–6 lata, acute acuta; scapis 1–nonnullis, 3–5 dm altis, bracteis vaginatis 2–jugis; spicis cylindricis, 3–5 cm longis, 6–8 mm latis, vulgo 10–15-floribus; bracteis naviculoideis non carinatis, oblanceolatis, induratis, scariosomarginatis, minute umbo-mucronulatis 12–14 mm longis; sepalis 2, subaequalibus scariosis (carinis exceptis), acutis, appositis, naviculoideo-conduplicatis, late et acute scarioso-carinatis, subaequalibus, tubo quam corollae lobis breviore; staminodis 3, filamentosis, cum staminibus alternatis; ovarii appendicibus apicalibus conspicuis integris, late obovatis, ca. 2 mm longis; capsulis 5–6 mm longis, induratis, anguste rhomboideis, appendicibus ca. 2 mm longis integris acutis; seminibus subobliquе oblongis ca. 1 mm longis, valde costatis.

Type: perennial herb with blue flowers, frequent, Sabana Venado, Caño Pimichín, aff. Río Guainía, Terr. Amazonas, Venezuela, 140 m alt., Nov 23, 1953, *Maguire, Wurdack & Bunting 36342.*

Specimens examined: VENEZUELA: Amazonas: Yapacana Savanna III, *Maguire, Cowan & Wurdack 39472; Maguire & Wurdack 34562; Maguire, Wurdack & Bunting 36598, 36600;* Sabana Venado, *Maguire & Wurdack 35592, Maguire, Wurdack & Bunting 36342* (holotype NY), *36382* (possibly hybrid with *A. grandis*). COLOMBIA: Vaupés: Cacagual, Río Atabapo, *Maguire, Wurdack & Bunting 36285.*

Distinguished from var. *macrostachya* by its narrow leaves. This variant, in the restricted areas observed, occupies an ecologically distinct habitat, occurring in open marshy savannas.

Abolboda macrostachya var. **robustior** Steyermark, Fieldiana Bot. **28:** 104. 1951.

A. rigida Gleason, Bull. Torrey Club **56:** 17. 1929.
A. excelsa Malme, Arkiv. Bot. **25A**^{12}: 16. 1933.

Type: leaves in rosette, pungent-tipped but inrolled, coriaceous, rich green; bracts brown-lavender with scarious margins; sandy wet meadow; on large mesa, Gran Sabana northwest Kavanayén at 1220 m alt., Oct 26, 1944, *Steyermark 57349.*

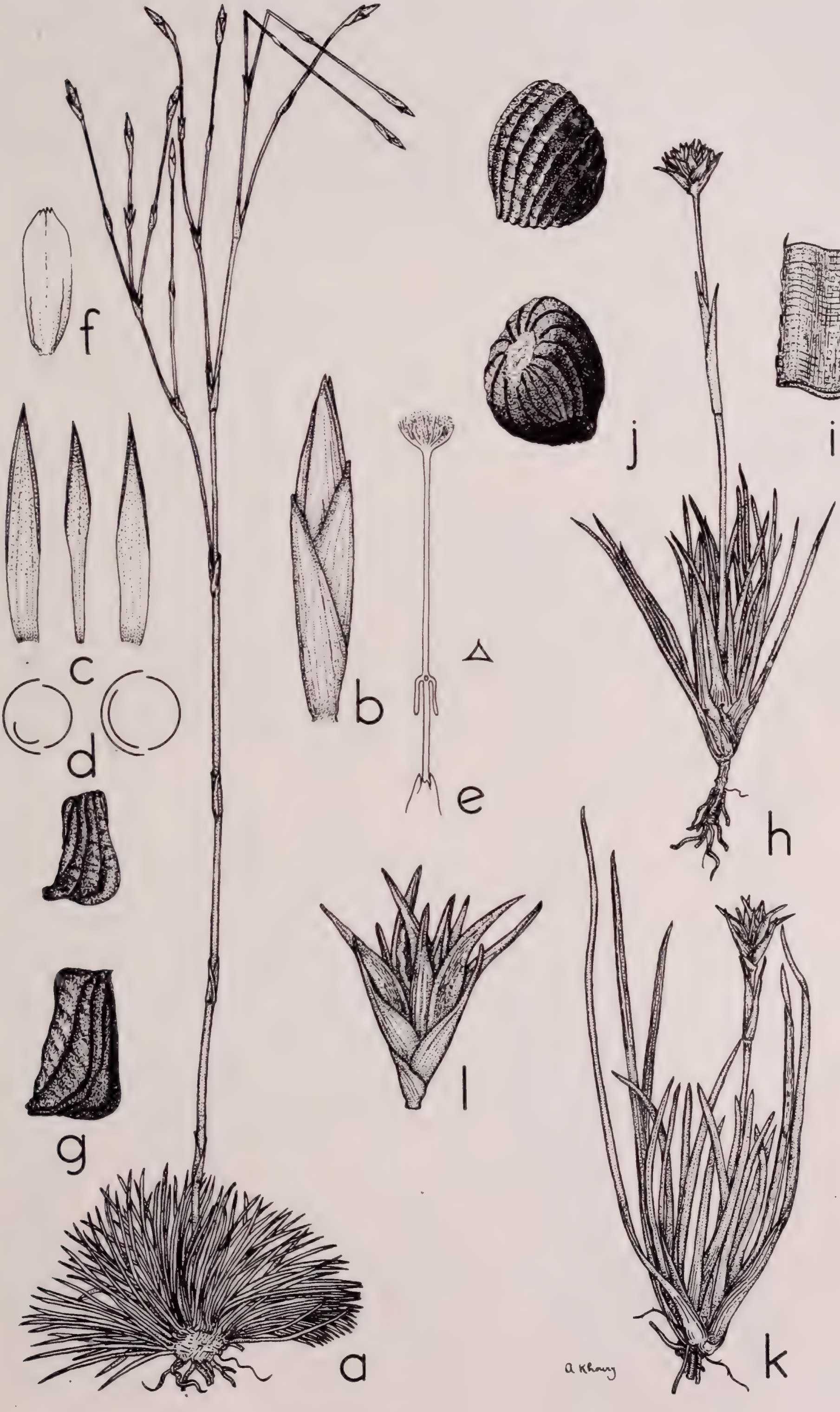
Specimens examined: BRITISH GUIANA: Membaru Creek, *Pinkus 223* (NY, F); Holitipu (Samwarakna-tipu), *Maguire & Fanshawe 32521.* ''British Guiana,'' *Schomburgk 1465* (K), type of *A. rigida* Gleason. VENEZUELA: Bolívar: Gran Sabana, sumpfen bei Río Cuquenan, Februari, 1910, *E. Ule* (K, photo NY), type of *A. excelsa* Malme. Auyán-tepuí, *Tate 1208;* Kavanayén, *Steyermark 59349* (holotype F, 2 sheets); Ptari-tepuí, *Steyermark 60243;* Auyán-tepuí, *Cardona 2614;* Ilu-tepuí *Maguire 33356, 33528.* Terr. Amazonas: Cerro Sipapo, *Maguire & Politi 27682, 27910, 28112, 28117, 28176.*

3. **Abolboda paniculata** Maguire, sp. nov. Figure 2.

Herbae perennes rhizomatibus brevibus et foliis numerosis dense rosulatis; foliis linearibus planis saepe acinaciformibus scabridis, marginibus angustis valde scabridis, basibus expansis sed non amplectantibus, apicibus triquetris acutis mucronulatis; scapo solitario, paniculate ramoso, 6–9 dm alto, cum 3 (vel) 4 jugis bracteis vaginatis subter ramo primo, 2.2–2.5 cm longis, lanceolatis acutis, supra vaginis 1.0–1.2 mm longis; spicis fusiformibus 22–24 mm longis, unifloris,

---

FIG. 2. a–g, *Abolboda paniculata.* a, habit, × ¼; b, spikelet, × 2; c, sepals, × 1½; d, section in diagram, left, at base, right median, × 3; e, style, × 1½, and median section; f, capsule, × 2; g, seed, × 20; drawn from *Cowan & Wurdack 31387.* h–j, *Abolboda ciliata.* a, habit, × ½; section of leaf-blade, × 10; seed, × 20; drawn from *Maguire, Wurdack & Bunting 37132.* k–l, *Abolboda bella.* k, habit, × ½; l, spikelet, × 1½; drawn from *Maguire & Wurdack 34514.*


f
c
d
g
b
e
l
j
i
h
k
a

bracteis sterilibus 2; sepalis 3, ca. 22 mm longis, nec carinatis nec conduplicatis, lateralibus appositis, tertio subanteriore, omnibus subter medio membranis oblanceolatis scariosomarginatis mucronatis; corollis caeruleis ephemeris; antheris sagittatis 5–6 mm longis; granis pollinis sphaeroideis, non aperturatis spinosis, 140–150μ diam., sporodermide 5 μ crassa, spinis tenuibus 6–7 μ longis; ovario oblongo-obovato, valvis cum appendicibus bidentatis apicalibus 1 mm longis; placentis axialibus, 4-seriatis; stylis triquetris, acute angulosis, ca. 3 cm longis, cum 3 appendicibus simplicibus reflexis subulatis, subter medio affixis; stigmatibut hypocrateriformibus fimbriatis; capsulis ca. 10 mm longis, 4 mm latis; seminibus numerosis, 0.7–0.8 mm longis, 0.8–0.9 mm latis, valde 8–10 vertice costatis, brunneo-rubris.

Type: perennial herb with branched inflorescence, fruiting, cumbre at 2000 m alt., Cerro Parú, Terr. Amazonas, Venezuela, Feb 10, 1951, *Cowan & Wurdack 31387*. Paratype: perennial herb with blue flowers, only once seen in flower, locally frequent, cumbre along west rim at 2000 m alt., Cerro Parú, Feb. 1, 1951, *Cowan & Wurdack 31300.*

Known only from the cumbre of Cerro Parú. The third sepal seems to be a normal feature of the flower.

The calyx of *A. paniculata* (and that of the next, *A. uniflora*) is unique in *Abolboda*. First, there are regularly three sepals, in contrast otherwise to the prevalance of two. Secondly, the sepals in *Abolboda* are characteristically opposite, decussate, conduplicate, and strongly keeled. Those of *A. paniculata* are neither conduplicate, decussate, nor keeled. The third sepal is inserted in a semianterior position, but its body becomes oriented within the convex surface of the first. This extraordinary departure from the prevailing arrangement within the genus, and the equally extraordinary departure in habit, suggest that *A. paniculata* and *uniflora* are not generically consistent with the conformative members of *Abolboda.*

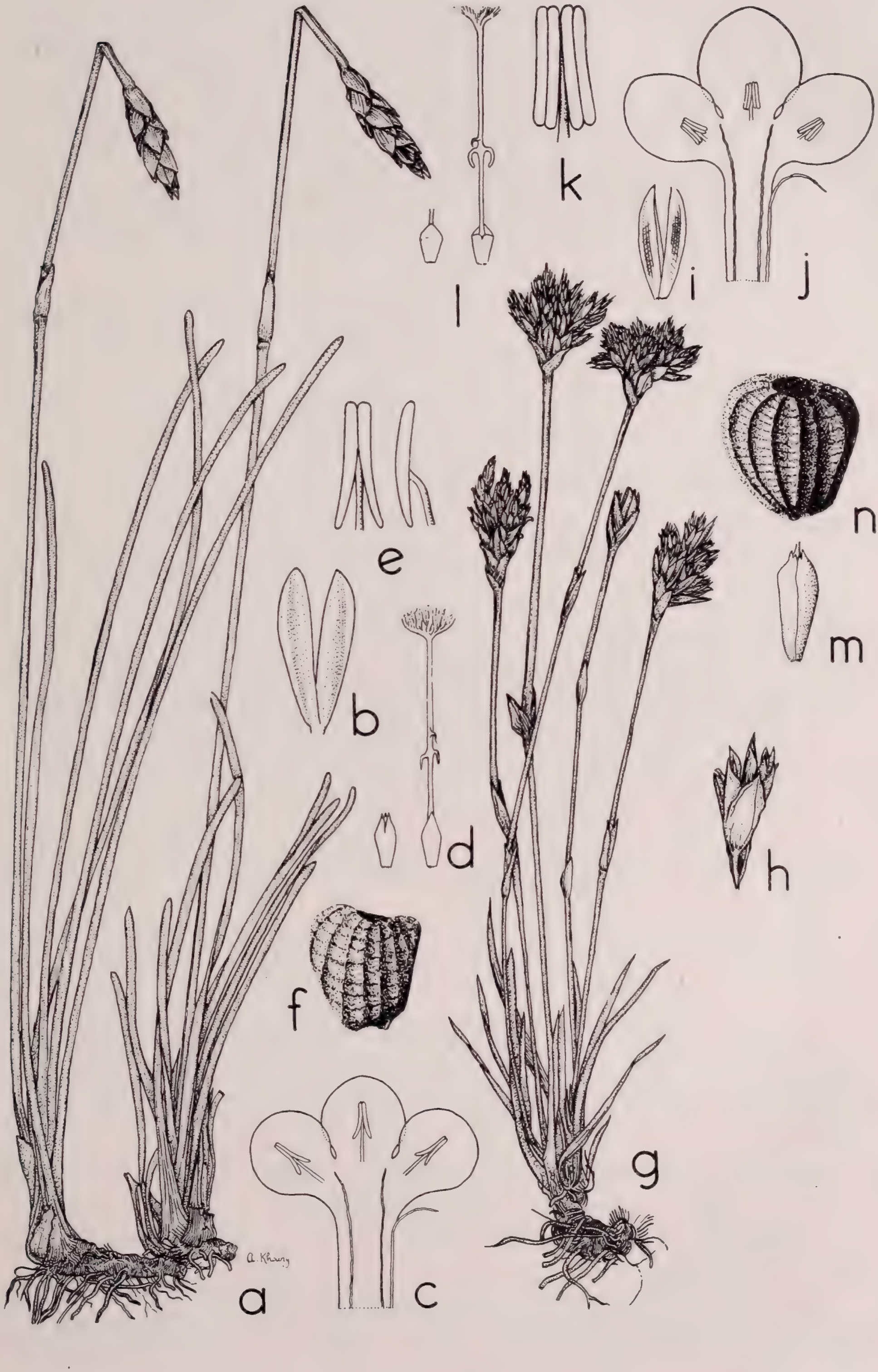
4. **Abolboda uniflora** Maguire, sp. nov.

Herbae perennes cum rhizomatibus brevibus et foliis numerosis dense rosulatis; foliis linearibus triquetris, laevibus, 2.0–3.5 cm longis, 0.8–1.5 mm latis, abrupte acutis, brevimucronulatis, basibus expansis sed non amplectantibus; scapo solitario 3–5 dm alto, 1.5–2.0 mm diam., cum 4–5-jugatis plus minusve aequaliter distantibus bracteis, subappositis vaginatis sterilibus, lanceolatis, ca. 2 cm longis, plurinervatis anguste scariosomarginatis; spiculis fusiformibus, terminalibus et solitariis vel etiam in axillis bractearum ultimarum vel penultimarum, floribus probabiliter eis *A. paniculatae* similibus.

Type: leaves grass-green; stems purple-brown as are bracts, around rills on rocky dry ridge-top, summit of Cerro Duida, Brocchinia Hill, at 1700–1980 m alt., Terr. Amazonas, Venezuela, Sept 1, 1944, *Steyermark 58169* (F, holotype, NY 2 sheets).

Known only by the type collection.

FIG. 3. a–f, *Abolboda linearifolia.* a, habit, × ½, from *Maguire, Wurdack & Bunting 37642;* b, sepals, × 2; c, corolla spread out, × 1½; d, pistil, × 2, ovary, × 3; e, anthers, × 6; drawings of floral parts all from *Maguire, Cowan & Wurdack 30468.* f, seed, × 20, drawn from *Maguire, Wurdack & Bunting 36381.* g–h, *Abolboda glomerata.* g, habit, × ½; h, spikelet, × 1½, from *Maguire & Wurdack 35593.* i–n, *Abolboda macrostachya* var. *angustior.* i, sepals, × 1½; j, corolla spread out, × 1½; k, anther, × 6; l, pistil, ovary dorsal and ventral views, × 1½; floral parts drawn from *Maguire, Wurdack & Bunting 36342;* m, capsule, × 2; n, seed, × 20; from *Maguire, Wurdack & Bunting, 36600.*


a
b
c
d
e
f
g
h
i
j
k
l
m
n
A. Khuzy

5. **Abolboda glomerata** Maguire, sp. nov. Figure 3.

Herbae perennes rhizomatibus horizontalibus ca. 6 mm diam.; foliis numerosis, planis, linearibus, 5–10 cm longis, 1–3 mm latis, ad basim vaginatis, apice acuto triquetro; scapis 1–pluribus, 15–30 cm longis, ca. 1.2 mm diam.; bracteis vaginatis 2–jugatis subappositis, amplectantibus, oblongo-lanceolatis abrupte acutis 12–15 mm longis; inflorescentiis glomeratis, glomerulis e pluribus spiculis aggregatis; bracteis subtendentibus oblongo-lanceolatis, exterioribus 10–12 mm longis ca. 6 mm latis, scariosomarginatis obtusis 9–11-nervatis; bracteis secondariis ordine parvioribus; bracteis florum similibus 5–7 mm longis; sepalis oblanceolatis, 6–7 mm longis, conduplicatis valde carinatis decussatis, apice acutiusculo; nec floribus nec capsulis visis.

Type: perennial herb, fruiting only, frequent in marshy savanna, Sabana Venado, left bank Caño Pimichín above Puerto Pimichín, affluent Río Guainía, at 140 m alt., Territorio Amazonas, Venezuela, April 14, 1953, *Maguire & Wurdack 35593* (holotype NY).

Known only from the type locality. No fertile flowering or fruiting material was found, although the plants seen appeared to be perfectly normal.

6. **Abolboda linearifolia** Maguire, sp. nov. Figure 3.

Herbae perennes, rhizomate brevi; foliis 4–6, terminalibus, linearibus, 1.5–2.0 mm latis, 15–45 cm longis, ad basim dilatatis vaginatisque, apice rotundato vel obtuso nec apiculato; scapo solitario, 30–45 cm longo, aliquantum compresso, 1.25–1.75 mm lato; bracteis 1–jugatis subappositis amplectantibus lanceolatis, 12–20 (25) mm longis; spica anguste elliptico-cylindrica vel cylindrica, 2.5–4.0 cm longa, 6–7 mm lata, 6–10-flora, bracteis floribusque strictis; bractea prima saepe fertili; bracteis naviculoideis sed non carinatis, induratis late oblanceolatis obtusiusculis scarioso-marginatis, 6–8 mm latis, 10–12 mm longis; sepalis 2, conduplicatis naviculatis acute et conspicue carinatis, obtusis late scarioso-marginatis; petalis 3, lobis serrato-crenulatis; appendicibus stylorum 2, simplicibus; antheris sagittatis 3 mm longis; capsulis oblongo-ellipticis 5.5–6.5 mm longis, 2.0–2.5 mm latis, latioribus supra, appendicibus erosis retusis ca. 1 mm longis; seminibus numerosis oblique oblongis, 1.0–1.2 mm longis (0.8–1.0 in sicco), testa exteriore hyalina papillosa, testa interiore firma rubella in 12–16 lineis oblique verticalibus alveolatis.

Type: perennial herb, inflorescence glaucous, flowers blue, frequent in open marshy areas, Yapacana Savanna III, at 125 m alt, Amazonas, Venezuela, Dec 31, 1950, *Maguire, Cowan & Wurdack 30468* (holotype NY).

Paratypes: VENEZUELA: Amazonas: Yapacana Savanna III: Jan 7, 1951, *Maguire, Cowan & Wurdack 30789;* Nov 20, 1953, *Maguire, Wurdack & Bunting 36603;* Yapacana Savanna II, Nov 20, 1953, *Maguire, Wurdack & Bunting 36622.* Sabanita, 1 km above Pimichín, Río Guainía, Nov 24, 1953, *Maguire, Wurdack & Bunting 36381;* Sabana Hechimoni, Río Siapa, Casiquiare, Feb 9, 1953, *Maguire, Wurdack & Bunting 37642;* Yavita, Río Temi, Río Atabapo, Jan 28, 1942, *L. Williams 14045* (F, US).

7. **Abolboda sprucei** Malme, Ark. Bot. **25A**^{12}**:** 17. 1933.

Abolboda schultesii Idrobo & Smith, Caldasia **6:** 246. 1954.

Distribution: known only from savannas of the Río Guainía in both Venezuela and Colombia.

Specimens examined: ad flumen, Guainía v. Río Negro, supra ostium fluminis Casiquiare, *Spruce 3456* (holotype K, isotypes S, P, photo NY). COLOMBIA: Puerto Colombia (opposite Venezuelan town of Maroa), *Schultes, Baker & Cabrera 18177* (holotype *A. schultesii,* COL); *18182* (COL). VENEZUELA: perennial herb with conspicuous bracts subtending the

spikes, frequent, sabanita 1 km east Maroa at 125 m alt., April 16, 1953, *Maguire & Wurdack 35688;* herb with pale blue flowers, sabanita, Maroa, Nov 25, 1953, *Maguire, Wurdack & Bunting 36419.*

8. **Abolboda bella** Maguire, sp. nov. Figure 2.

Herbae perennes rhizomatibus subligneis horizontalibus 2–5 cm longis, 4–5 mm diam.; foliis vulgo 8–12, basilaribus, linearibus, (3) 6–15 cm longis, 1.5–4.0 mm latis, marginibus integris subhyalinis, costatis, 3–5-nervatis, abrupte mucronulatis, basi expansa vaginata; scapis solitariis laevibus, 6–10 cm longis, ca. 1 mm diam., 1 jugo bractearum basilarium subtento, et sursum 1 jugo subappositarum amplectantium bractearum, ca. 2 cm longarum acuminatarum, spica subtenta; spicis 1.5–2.0 cm longis, obpyriformibus 3–5-floris; bracteis cephalaribus sterilibus vulgo 2, lanciacuminatis, 15–18 mm, costa prominenti mucronulata, bracteis fertilibus lanciacuminatis, 12–15 mm longis; sepalis 2, acute carinatis enervatis induratis aliquantum recurvatis. 16–20 mm longis, lanciacuminatis marginibus late scariosis; corollis caeruleis, essentialiter regularibus, 2.2–2.5 cm longis, tubo 1.2–1.5 cm longo, lobis late obovatis; antheris sagittatis, ca. 2.5 mm longis; granis pollinis sparse spinosis obovato-sphaeroideis, 120–140 μ diam., sporodermide 10 μ crassa, spinis obtuse conicis, ca. 5 μ longis; ovario oblongo, ad apicem papilloso, trigonali 3–loculari; stylo trigonali facie ipso sulcato, appendicibus 3 linearibus gibberoso-saccatis reflexis, quoque cum adunculo; stigmate crateriformi aliquantum gibberoso profunde fimbriato; capsula seminibusque ignotis.

Type: small herbaceous perennial. 15 cm or less high, flowers dark clear blue; infrequent in marshy area, Yapacana Savanna III, Territorio Amazonas, Venezuela, at 125 m alt., March 17, 1953, *Maguire & Wurdack 34514* (holotype NY).

Abolboda bella is obviously most closely related to *A. abbreviata* Malme, known only by the type collection *Ducke 11895* (see below).

The two species may be contrasted as follows:

A. abbreviata	*A. bella*
Plant cespitose, 6–8 cm high, pluriscapose (1–5).	Plant not cespitose, 10–15 cm high, uniscapose.
Spikes 1 cm long.	Spikes 1.5–2.0 cm long.
Cephalar bracts broadly lanceolate, 7–8 mm long.	Cephalar bracts lance-attenuate, 15–18 mm long.
Sepals 9–10 mm long.	Sepals 16–20 mm long.

9. **Abolboda abbreviata** Malme, Ark. Bot. **19**^{13}: 5. 1925.

Known only by the type collection: Campos do Ariramba (in regione medii flum. Trombetas, civ. Pará), locis uliginosis, flores pulchre azures, July 5, 1912, *Ducke 11895* (holotype S, isotype S, NY, US).

10. **Abolboda poarchon** Seubert in Mart. Fl. Bras. 3^{1}: 223. 1871.

A. poarchon var. *exaltata* Malme, nomen.
A. chapadensis Hoehne, Comm. Link. Telegr. Estrat. Matto Grosso, Annexo 5, Bot. pt. 5: 11. *pl. 80, f. 2.* 1915.

A. poarchon is a variable species, undoubtedly having within it a number of segregate populations of greater or lesser distinctness. It is most closely related to *A. pulchella,* and indeed merges with this species. Because of its larger habit, more numerous flowers, and acute mucronate cephalar bracts, it is in most instances easily separable from *A. pulchella*, of smaller habit with few-flowered (usually 2–3) spikes, and obtuse, umbose, short linear appendiculate cephalar bracts. By the use of these criteria, there are included in the exsiccatae cited below a number of plants which because of their shorter narrower leaves have been interpreted as belonging to *A. pulchella*.

Type: campis ascensus Chapada do Paranán, Minas Geraes, Brazil, *Martius 1728* (*Poarchon coerulea* Mart. mss.).

Specimens examined: BRAZIL: Diamantina, *Barreto 9657* (F): Goyaz, *Gardner 3486* (paratype F, NY, P); Goyaz, *Glaziou 22233* (F, P, S); Minas Gerais, *Glaziou 20520* (F, P); *Loefgren 1477* (S); Goyaz, *Macedo 3700* (NY, S, US); Minas Gerais, *Martius 1728* (holotype M, isotype M); Matto Grosso: *Malme 2354* (S), *1965* (S), *1965A* (S), *1965b* (S); Pará, *Herb. Goeldi 15061* (S, US); Minas Gerais, *St. Hilaire 1914* (P); *878* (P); St. Paul, *St. Hilaire 1281* (P); Sertão d'Amaroleité, *Weddell 2723* (P); Goyaz, *Ule 227* (US).

11. **Abolboda pulchella** Humb. & Bonpl. Pl. Aequin. **2:** 110. *pl. 114.* 1813.

Xyris vaginata Spreng. Syst. Veg. **1:** 183. 1825.
Abolboda brasiliensis Kunth, Enum. Pl. **4:** 26. 1843.
Abolboda vaginata (Spreng.) Alb. Nilss. Sv. Vet.-Akad. Handl. **24**^{14}: 63. 1892.
Abolboda longifolia Malme, Bih. Sv. Vet.-Akad. Handl. **22:** (Afd. III. No. 2): 20. *pl. 2.* 1897.
Abolboda gracilis Huber, Bol. Mus. Goeldi **5:** 323. 1909.
Abolboda chapadensis var. *pauciflora Hoehne*, Comm. Link. Telegr. Estrat. Matto Grosso, Annexo 5, Bot. **5:** 12. 1915 (nos. 3595, 3596).

Distribution: marshy or inundable savannas and campos, French Guiana, southern Venezuela, Amazonian Colombia to Matto Grosso, Minas Gerais and Goyaz, Brazil.

Specimens examined: FRENCH GUIANA: Charvein, Savane blanche, Jan 19, 1914, *R. Benoist 627* (P. 2 sheets). VENEZUELA: Bolívar: south of Mount Roraima, *Steyermark 59178* (F, NY, US); *59178a* (F); Kavanayén, *Steyermark 60301* (F, NY, US); Kavanayén, *Lasser 1814* (NY, US); Cerro Bolívar, *Wurdack 35751* (NY). Edo. Anzoategui: Tigrito, *Pittier* (US). Amazonas: Mapures, *Spruce 3651* (NY); Puerto Zamuro, Atures, *Gaillard 107* (P); Puerto Ayacucho, *Williams 15944* (F, US). COLOMBIA: Vaupés: Savanna de Yapoboda, *Allen 3137* (COL). BRAZIL: Terr. Rio Branco: Boa Vista, *Kuhlman 3569* (S); Serra do Murupú, *Luetzelburg 20772;* Serra Tepequem, *Maguire & Maguire 40118* (NY). Edo. Pará: Pramlia, *Ducke 3646* (S); Ilha do Marájo, *Lima 42* (COL, US); *91* (US). Minas Gerais: Diamantina, *Barreto 9659* (F). Goyaz: Morro Redondo, *Glaziou 22234* (P, US). Edo, Matto Grosso: Source du Paraguay, *Weddell s.n.* (P); Santa Anna do Chapada, *Robert* in 1902 *s.n.* (S); Rio Langrador, *Lindman A2421* (S, 2 sheets); inter São Jeronymo et Cuyabá, *Malme 1402* (S, holotype of *A. longifolia* Malme); Santa Anna do Chapada, Sept 20, 1902, *Malme s.n* (S); Oct 4, 1902, *Malme s.n.* (S); Aricá prope Cuyabá, *Malme 3262* (S, US); *3262A* (S); May 10, 1903, *s.n.* (S); *Smith 171* (US); Aricá, *Hoehne 3603* (photo US); without definite locality, *Gardner 4024* (NY).

With the exception of *A. americana*, *Abolboda pulchella* is the most widely distributed species of the genus. To the north of the Amazon River, the population is remarkably uniform. To the south of the river, however, the species is quite variable, as is attested by the several names proposed for it. Smith and Downs have recently[8] concluded that the entire population must come under one name. I am in agreement with this position. However, I do feel that there are probably represented several strong infraspecific geographic and morphologic races, one of which would be the long-leafed, large-spiked specimens from the vicinity of Cuyabá, Matto Grosso, formerly described by Malme as *A. longifolia*. Such luxuriant individuals as these (i.e. specimens referable to *A. longifolia*) form a very close connecting link with *A. poarchon* Seub.

---

[8] Jour. Wash. Acad. **44:** 313. 1954.

12. **Abolboda acicularis** Idrobo & Smith, Caldasia 6: 250. 1954.

Key to the Varieties of *A. acicularis*

1. Leaves smooth, subsubulate, densely rosulate, 1–2 cm long; cephalar bracts and sepals obtusish, conspicuously aristate. var. *acicularis*.
1. Leaves strongly granular, plano-triquetrous, little or not densely rosulate, (1) 2–6 cm long; cephalar bracts and sepals finely acute and merely mucronulate; flowers white. var. *granularis*.

Abolboda aciularis var. **acicularis.**

Specimens examined: terrestrial herb, Savanna de Yapoboda, Alto Río Cuduyarí, Vaupés, Colombia, Dec 10, 1943, *Paul H. Allen 3150* (holotype, COL); Río Paraná, Pichuna, Vaupés, Colombia, *Schultes & Cabrera 19926* (COL); *19966* (COL); open savanna, 1 km. west Cacagual, Colombia, Río Atabapo, *Maguire, Wurdack & Bunting 36288* (intermediate).

Abolboda acicularis var. **granularis** Maguire, var. nov.

Folia valde granularia, plano-triquetra, vulgo 2–6 mm longa; bracteis cephalaribus acutissime acutis et tantum mucronulatis.

Type: perennial herb with white flowers, occasional in open marshy area, Sabana Venado, left bank Caño Pimichín, above Puerto Pimichín, at 140 m alt., Nov 23, 1953, Río Guainía, Terr. Amazonas, Venezuela, *Maguire, Wurdack & Bunting 36341* (holotype NY).

Additional specimens: Sabana Venado, *Maguire & Wurdack 35594*; Cerro Yapoboda, Vaupés, Colombia, *Schultes & Cabrera 14379-C* [fragment] (COL).

13. **Abolboda ciliata** Maguire & Wurdack, sp. nov. Figure 2.

Herbae perennes caudicibus erectis 6–8 cm longis, 2.5–3.0 mm diam.; foliis rosulatis linearibus 4–9 cm longis, 1.5–3.0 mm latis, plano-triquetris marginibus involutis serrulato-ciliatis, apice truncato, unilateraliter mucronato-aduneulatis, basi expansa scariosa amplectanti; scapo solitario axillari, 15–25 cm longo, ca. 1.5 mm diam.; bracteis 1 jugo subappositis amplectantibus lineari-lanceolatis ca. 4 cm longis, late scariosomarginatis obtusis, in medio scapo vel sursum affixis; spicis globosis vel obpyriformibus, ca. 15 mm longis, ca. 10-floris; bracteis subtendentibus 2, lanceolatis late scariosomarginatis, 12–14 mm longis; sepalis 2, navicularibus carinatis ca. 8 mm longis, late scarioso-marginatis; ovario obpyriformi, ca. 5 mm longo, 2.5–3.0 mm lato, apice 3-lobato, lobis 0.8 mm longis erosis; seminibus oblique ovali-oblongis, 10–12 spiraliter costatis, rubro-brunneis, 1.0–1.2 mm longis, 0.6 mm latis.

Type: perennial herb, fruiting only, locally frequent in boggy open cumbre savanna, 5 km. west Cumbre Camp, at 1900 m alt., Cerro de la Neblina, Terr. Amazonas, Venezuela, Jan 6, 1954, *Maguire, Wurdack & Bunting 37132* (holotype NY).

Known only by the type collection.

14. **Abolboda ebracteata** Maguire & Wurdack, sp. nov.

Herbae perennes rhizomate horizontali brevi; foliis primariis convolutis 6–12 cm longis, ca. 1 mm diam. (convolutis), basi vaginata, marginibus conspicue scariosis, apice abrupte obtuso, seta caduca instructis, foliis secondariis (vel juvenilibus) 1.5–2.5 cm longis; scapo solitario, 10–20 cm longo, ad basim 3 vel 4 lineari-acuminatis subscariosis bracteis 1–3 cm longis subtento, aliter scapo ebracteato; spicis 3–4-floribus, 2 bracteis cephalaribus subtentis, exteriore ca. 15 mm longa et spicam exsuperanti, interiore ca. 10 mm longa et spicae subaequali, ambobus lancisubulatis, deorsum expansis et amplectantibus, sursum subulatis obtusis probabiliter seta caduca instructis; floribus vulgo 3; sepalis 2, 8–10 mm longis, setis instructis, exteriore 2-carinato; corollis caeruleis; antheris 4-locularibus, sagittatis; stylo 3 (2) appendicibus simplicibus; capsulis seminibusque non visis.

Type: perennial herb with dark blue flowers, frequent in open marshy places, Yapacanna Savanna III at 125 m alt., Territorio Amazonas, Venezuela, Dec 31, 1950, *Maguire, Cowan & Wurdack 30469* (holotype NY). Paratype: perennial herb, infrequent in marshy area, edge Yapacana Savanna III, March 17, 1953, *Maguire & Wurdack 34516*.

15. **Abolboda americana** (Aublet) Lanjouw, Rec. Trav. Bot. Néerl. **34:** 492. 1937.

Xyris americana Aublet, Hist. Pl. Gui. Franç. **1:** 140. *pl. 14.* 1775.
Xyris coerulea Lam. Tab. Encyc. **1:** 621. 1791.
Chloerum gramineum Wittel. Herb. n. 1068 (acc. Seubert).
Abolboda imberbis H.B.K. Nov. Gen. & Sp. **1:** 256. 1815.
Abolboda inermis Link ex Steud. Nom. ed. 2. 2. 1840.
Abolboda ? aubletii Kunth. Enum. Pl. **4:** 28. 1843 (nec syn. *Xyris jupicai* Rich.).
Abolboda poeppigii Kunth, Enum. Pl. **4:** 27. 1843.
Abolboda americana var. *imberbis* (H.B.K) Maguire, Bull. Torrey Club **75:** 193. 1948.

This species is widespread, and with *Abolboda grandis*, both having nearly coincident ranges, and *A. pulchella*, has the most extended distribution of all species of the genus. It occupies sandy savannas or campos in Coastal Guiana between the Orinoco and Amazon, inland areas of the Río Negro and Upper Orinoco, and is locally conspicuous on the Kaieteur savannas of Guayana.

Throughout this great range it is variable, very probably, as suggested by Lanjouw (l.c.), responsive to local ecologic conditions.

On the Kaieteur, the species reaches the most luxuriant development, reaching nearly 15 cm in height. But specimens from Yapacana on the Alto Orinoco are nearly as large. Specimens from Zanderij Savannas, Suriname, somewhat less high, have relatively shorter leaves and coarser scapes with commonly larger heads. Most of the specimens from the interior Río Negro—Río Guainía region, and from the Amazon Estuary (Campina Vigia), Pará, are more diminutive. Plants of this form became the types of the previously proposed names that fall within the limits of the species, viz., *Xyris americana* Aubl., *Abolboda imberbis* H.B.K., and *A. poeppigii* Kunth. I have now seen Aublet specimens at Paris and the British Museum, and Poeppig specimens at numerous herbaria.

If infraspecific taxa are to be recognized, they would then have to be derived from variants such as those developed at Kaieteur and Yapacana, at Zanderij, and a minor form with acutish leaves and acute bracts and sepals collected by Baldwin (*3558*), in the Río Vaupés.

Specimens examined: BRITISH GUIANA: Kaieteur Savanna: *Sandwith 1424* (K, NY); *Maguire & Fanshawe 23116* (K, NY), *23178* (NY, F), *23188* (NY, F). SURINAME: Zanderij: *Stahel 115* (NY); *Maguire & Stahel 23666* (NY); Tafelberg, *Maguire 24211* (NY). French Guiana: *Aublet s.n.* (holotype BM, isotype P, photo NY). BRAZIL: Pará: Colares, *Poeppig 2993*, type of *A. poeppigii* Kunth (P, F 2 sheets, M); Colares, *Ducke 18968*, topotype of *A. poeppigii* Kunth (S, 2 sheets); Campina do Vigia *Black 50–8317* (COL); *Drouet 2130* (F); *Froes 27839* (COL); *Pires 4085* (COL). Amazonas, Bella Vista, Vaupés, *Baldwin 3558* (F, COL, US). VENEZUELA: Amazonas: Esmeralda, *Tate 299* (NY); Esmeralda, *Steyermark 57831* (F, NY): *57847* (F, NY): Yapacana, *Maguire, Cowan & Wurdack 30482* (NY); *Maguire, Wurdack & Bunting 36592* (NY); *36612* (NY); Sabana Venado, Pimichín, *Maguire & Wurdack 35566* (NY); Maroa, *Maguire & Wurdack 35690* (NY).

16. **Abolboda killipii** Lasser, Bol. Soc. Venez. Ci. Nat. **9:** 179. 1944.

Abolboda psammophila Maguire, Bull. Torrey Club **75:** 193. 1948.

Type: sabanas fangosas cerca de Río Tonoro, Alto Paragua, Edo. Bolívar, Venezuela, Aug 20, 1943, *Cardona 823* (holotype VEN, isotypes NY, F).

Distribution: open sandy flats and savannas, coastal Suriname, British Guiana, and Río Paragua (Orinoco drainage), Venezuela.

Specimens examined: SURINAME: perennial herb, frequent open sandy area subject to frequent inundation, west side of railroad, Zanderij, June 3, 1944, *Maguire & Stahel 23667* (type of *A. psammophila* Maguire). BRITISH GUIANA: common on savanna, "fl. white," Karakara, Demerara River, Feb 1910, *C. W. Anderson F. D. No. 510* (K, NY). VENEZUELA: *Cardona 823* (holotype VEN, isotypes NY, F).

17. **Abolboda acaulis** Maguire, Bull. Torrey Club **75**: 191. 1948.

Type: locally frequent, tufted perennial herb 2–3 cm high, rootstocks fleshy, flowers 1 or 2, pale blue; in white sand from conglomerate and sandstone, Kaieteur Plateau, British Guiana, April 30, 1944, *Maguire & Fanshawe 23096.*

Distribution: plants of savannas and open stream-sides at higher altitudes, on wet sand overlying Roraima sediments.

Specimens examined: BRITISH GUIANA: Kaieteur Plateau: *Maguire & Fanshawe 23096* (holotype NY, isotype F, NY, US, K); Feb 15, 1955, *Maguire, Bagshaw & Maguire 40700; 40701;* savanna above Chi Chi Landing, Mazaruni River, Feb 10, 1955, *Maguire, Bagshaw & Maguire 40669; 40669-A;* scrub savanna, Kamarang Station, *Maguire & Fanshawe 32609;* Imbaimadai Savannas, *Maguire & Fanshawe 32169;* Holi-tipu, *Maguire & Fanshawe 32516;* Ayanganna Savannas, *Maguire, Bagshaw and Maguire 40618.* VENEZUELA: Bolívar: Kavanayén, *Maguire 33730; 33749;* San Rafael, *Maguire 33179;* Chimantá, *Steyermark 75784; Steyermark & Wurdack 457;* Guaiquinima, *Maguire 32820.* Amazonas: Cerro Sipapo, *Maguire & Politi 27659; 27700; 27778; 27923; 28691;* Cerro Huachamacari, *Maguire, Cowan & Wurdack 30154; 30720;* Cerro Guanay, *Maguire, Phelps, Hitchcock & Budowski 31703; 31773-A;* Cerro Yutaje, *Maguire & Maguire 35214; 35249.*

RAPATEACEAE

The taxonomic history of the family began in 1775 with the description by Aublet (l.c.) of *Rapatea paludosa.* By 1873, in the notable monograph of Körnicke (l.c.), 19 species held in seven genera were presented. In 1930, Pilger, in the *Natürlichen Pflanzenfamilien,* listed nine genera and 25 species. Now, chiefly as a result of contemporary exploration in South American Guayana, 16 genera[9] and some 80 species are known, an increase during the past two and a half decades of seven genera and 55 species.

Perhaps no other family of flowering plants can be considered more characteristic of the phytogeographic province of Guayana than the Rapateaceae. Its members occupy a most prominent place on the "cumbres" of the tabular mountains and the open upland plains of the Gran Sabana of the Roraima sandstone regions, and are ornamentally conspicuous on the historically and in some respects ecologically related low altitude natural savannas of the Upper Río Orinoco and Río Negro drainages.

The center of distribution and the greatest concentration of genera and species lie within the periphery of Guayana. Of the 16 genera now known, 10 with a specific population of some 41 species are entirely confined to this region. Of the remaining six genera, only two, the monotypic African *Maschalocephalus* and the bitypic trans-Andean *Epiphyton* are wholly extra-Guayanan. Within the four genera *Rapatea, Saxofridericia, Cephalostemon,* and *Spathanthus,* with a total of 31 species, 13 are wholly extra-Guayanan, 15 wholly Guayanan, and only two, *Spathanthus unilateralis* (by the intrusion into Guayana of the var. *jenmani*) and *Rapatea paludosa*, are common to both regions. Thus, of 80 species, 62 are confined to Guayana, 16 occur without the periphery of Guayana, and two species with their ranges chiefly outside barely intrude into Guayana.

---

[9] The two largest genera, *Rapatea* and *Stegolepis,* with some 20 species now known for each, are not treated in this review. The opportunity of further study in the field interrupts this writing and dictates the postponement of even a preliminary presentation of these two most complex genera of the family, until return is made from our imminently approaching expedition to Guayana in Amazonian Venezuela.

These figures are summarized by genera in the following table.

	Total No. Species	*Guayana*	*Extra-Guayana*
I. Subfam. *Saxofridericioideae.*			
Tribe Saxofridericieae.			
1. *Saxofridericia* Rob. Schomb.	9	7	2 wholly
2. *Phelpsiella* Maguire.	1	1	
3. *Amphiphyllum* Gleason.	2	2	
4. *Stegolepis* Körnicke.	20[10]	20[10]	
5. *Epiphyton* Maguire.	2		2 wholly
Tribe *Schoenocephalieae.*			
6. *Kunhardtia* Maguire.	1	1	
7. *Guacamaya* Maguire.	1	1	
8. *Schoenocephalium* Seub.	5	5	
II. Subfam. Rapateoideae.			
Tribe *Rapateeae.*			
9. *Rapatea* Aublet.	20[10]	12	8 (2 wholly)
10. *Cephalostemon* Rob. Schomb.	5	1	4 wholly
11. *Duckea* Maguire.	4	4	
12. *Spathanthus* Desv.	2	1	1
Tribe Monotremeae.			
13. *Monotrema* Körnicke.	5	5	
14. *Potarophytum* Sandwith.	1	1	
15. *Windsorina* Gleason.	1	1	
16. *Maschalocephalus* Gilg & Schumann.	1		1 wholly
	80	62	18

Monocotyledonous *Rapateaceae in the Natürlichen Pflanzenfamilien* (1930) are associated in the Unterreihe *Bromeliineae*, with the *Thurniaceae* and *Bromeliaceae*. Hutchinson (1934) has placed the *Rapateaceae* with the *Xyridaceae* in the *Xyridales*, and suggests derivation of the order, thus restricted, from or through the presumptively more primitive *Commelinales*. Erdtman[11] states that the pollens of the *Xyridaceae* and the *Rapateaceae* are "different." I am inclined to agree that affinities lie with the *Xyridaceae*, but that the *Rapateaceae* are not immediately allied to them.

There follows a preliminary arrangement of hierarchy within the family, and a presentation of new genera and species which, it is hoped, will serve as a framework for an effective morpho-taxonomic monograph.

---

[10] Approximate figures.

[11] *Pollen morphology and plant taxonomy* 454. 1952.

Rapateaceae Robert Schomburgk, Die *Rapatea* Friderici Augusti und Saxo-Fridericia regalis, entdeckt und beschrieben 8. 1845.

Flowers hermaphrodite, actinomorphic or essentially so, trimerous. Sepals 3, lanceolate, usually free, rigid, indurated, hyaline at the base, imbricate. Petals 3, usually connate at the base, the lobes lanceolate, ovate or obovate, convolutely imbricate. Stamens 6, the filaments usually connate at the base and/or adnate to the corolla-tube; anthers basifixed, 4- or sometimes 2-celled, dehiscing by 1, 2, or 4 apical or subapical pores. Ovary superior, perfectly or imperfectly 3-celled with axial, subbasal, or basal placentation; ovules several or solitary, anatropous. Seed subglobose, oblong, pyramidal, semiannulate, or subprismatic, appendiculate or exappendiculate, striate or muriculate; albumen mealy, copious; embryo lenticular.

Perennial monocotyledonous herbs with short, commonly simple, usually erect, subfleshy rootstock, and linear or gladiate leaves, with blades rotated more or less through 90 degrees surmounted on strongly developed conduplicate sheaths.

Type: *Rapatea paludosa* Aubl.

A family of 16 genera and some 80 species, all of the American tropics§ except the monotypic *Maschalocephalus dinklagei* Gilg & Schumann of Liberia and Sierra Leone, Africa. Flowers often of great beauty.

A. Subfam. **Saxofridericioideae** Maguire, subfam. nov.

Carpella pluriovulata; placenta axillari vel aliquando in septo; seminibus plus-minusve prismaticis, pyramidalibus, vel lunatis.

B. Trib. **Saxofridericieae** Maguire, trib. nov.

· Corolla flava pura; petalis obovatis vel obcordatis, conspicue exsertis.

B. Trib. **Schoenocephalieae** Maguire, trib. nov.

Corolla (et quidem spicula in tota) rubra vel rubritincta; petalis anguste lanceolatis, inclusis (*Kunhardtia* excepta).

A. Subfam. **Rapateoideae** Maguire, subfam. nov.

Carpella uniovulata; placenta basilari vel subbasilari axillari; seminibus ovalis vel oblongis.

C. Trib. **Rapateeae** Endlicher, Gen. Pl. 1: 131. 1836–1840.

Seed longitudinally striate, without apical appendage or with a papillate-mitriform appendage; cephalar bracts conspicuously exceeding the inflorescence.

C. Trib. **Monotremeae** Maguire, trib. nov.

Semina alba granulata nec in longitudine striata; appendicibus apicalibus applanatis; bracteis cephalaribus vulgo plus-minusve aequalibus vel brevioribus quam inflorescentiis maturis.

---

§ In recent years two additional monotypic African genera, *Apartea* Pellegr. and *Langevinia* Jac.-Fél., have been attributed to the *Rapateaceae*.

Of the two species involved, the first, *Apartea le-testui* Pellegr. (Bull. Soc. Bot. Fr. **77**: 473, 474. 1930) was transferred a year later to the *Cyperaceae* by its author as *Mapania le-testui* (Pellegr.) Pellegr. (Bull. Soc. Bot. Fr. **78**: 180. 1931). This transfer seems to have been advisedly made. The second, *Langevinia monosperma* Jac.-Fél. (Bull. Mus. Hist. Nat. Paris II. **19**: 88. 1947), from African Cameroons (*Jacques-Félix 2472*), was based on fruiting material only. The specimen (or specimens) is said to be rapateoid in habit, which is indeed suggested by the published figure (l.c.). It is further said to be (I have seen no material of it) devoid of perianth and stamens, and to have a 1-locular, indehiscent drupaceous fruit, characteristics altogether inconsistent with the *Rapateaceae*. In the otherwise phyletically and morphologically little-complicated *Rapaeaceae*, the fruit is invariably a 3-locular dehiscent capsule. Therefore, until I can examine specimens and until confirmatory flowering material is at hand, in spite of the similarity of habit I prefer to exclude *Langevinia* from the *Rapateaceae*.

Key to the Genera of Rapateaceae

1. Carpels pluriovulate; placenta axial or sometimes also on the partitions; seed more or less prismatic or pyramidal, neither oval nor oblong (*Saxofridericioideae*).

  2. Corollas yellow; petals obcordate or obovate, conspicuously exserted (*Saxofridericieae*).

    3. Inflorescence bibracteate (pluribracteate in *Saxofridericia regalis*), bivalvate; scapes commonly solitary, sometimes 2.

      4. Anthers 4-celled, apically appendaged, dehiscing by a single subapical pore; heads massive, subglobose or hemispheric; coarse perennial herbs 1.5 m or more high; scapes terte or compressed. 1. *Saxofridericia.*

      4. Anthers 2-celled, exappendiculate, dehiscing by 2 circular apical pores; heads small, strongly compressed; perennial herbs 0.5 m or less high; scapes strongly compressed, broadly winged. 2. *Phelpsiella.*

    3. Inflorescence tri- or pluribracteate, the 2 outer bracts valvate, keeled, connate, the inner enclosed; scapes solitary or few; leaves narrowly linear, 8–10 mm broad, involute. 3. *Amphiphyllum.*

    3. Inflorescence ebracteate, or the bracts represented by a short scale-like membrane; scapes several or numerous, rarely only 1.

      5. Anthers strongly transversely rugose; 4-celled; seed pyramidal; endocarp not separating from the exocarp; terrestrial. 4. *Stegolepis.*

      5. Anthers smooth, not at all rugose, 1-celled; seed disciform; endocarp indurate, separating from the exocarp; epiphytic. 5. *Epiphyton.*

  2. Corollas and/or spikelets red or reddish; petals narrowly lanceolate, included within the indurated sepals, except for *Kunhardtia* (*Schoenocephalieae*).

    6. Corollas conspicuously exserted, porrectate; heads depressed-subglobose; anthers 2-celled; leaf-blades exceeding 3 cm in width. 6. *Kunhardtia.*

    6. Corollas included within the sepals; heads spheroidal, the flowers radiate at maturity; anthers 4-celled, at least towards the base; leaf-blades less than 3 cm in width.

      7. Apex of the anthers bilobed, dehiscing by 2 apical pores; heads relatively massive; cephalar bracts ruptured by the expanding inflorescence, not reflexed; union of leaf-blade and sheath transversely abrupt. 7. *Guacamaya.*

      7. Apex of the anthers cruciform, dehiscing by 4 apical pores, the lateral often at length confluent; heads spherical, smaller; cephalar bracts reflexed; union of leaf-blade and sheath reciprocally obliquely attenuate. 8. *Schoenocephalium.*

1. Carpels uniovulate; placentation basal or axially subbasal; seed oval or oblong (Rapateoideae).

  8. Seed oval-oblong or oblong, longitudinally striate, devoid of an apical appendage, or the appendage papillate-mitriform; involucral bracts conspicuously surpassing the inflorescence (*Rapateeae*).

    9. Involucral bracts 2, bivalvate; ovary perfectly 3-celled.

      10. Anthers cochleariform-appendaged; seed exappendiculate; leaves nongramineous. 9. *Rapatea.*

      10. Anthers exappendiculate: leaves gramineous.

        11. Seed with a conspicuous papillate-mitriform appendage. 10. *Cephalostemon.*

        11. Seed exappendiculate. 11. *Duckea.*

    9. Involucral bract solitary, spathaceous, laterally adnate to the elongate spicate inflorescence; ovary imperfectly 3-celled, only a solitary cell developing. 12. *Spathanthus.*

  8. Seed oval to subglobose, more or less conspicuously white-granulate, not striate, apically applanate-appendaged; involucral bracts equaling or shorter than the mature inflorescence (*Monotremeae*).

    12. Inflorescences long-pedunculate, much exceeding the leaf-sheaths.

      13. Spikelets sessile, the inflorescence capitate; anthers 4-celled, dehiscing by an apical pore.

        14. Inflorescence bibracteate, bivalvate; anther-pore obliquely terminal; capsule retuse; leaves more or less gramineous. 13. *Monotrema.*

        14. Inflorescence quadribracteate, the bracts decussate; anther-pore transversely terminal; capsule deeply emarginate; leaves broadly linear, not gramineous. 14. *Potarophytum.*

13. Spikelets pedicelled, the inflorescence subumbellate, subtended by a solitary lanceolate bract, each pedicel subtended by a similar but smaller bract; anthers 4-celled, dehiscing by a subapical lateral pore; capsule retuse; leaves broadly linear, not gramineous. 15. *Windsorina.*

12. Inflorescences short-pedunculate, not at all or barely exserted from the subtending leaf-sheaths; filaments pubescent, much exceeding the corolla; anthers unilocular, dehiscing by a solitary subapical pore; African 16. *Maschalocephalus.*

Saxofridericioideae, Saxofridericieae

Saxofridericia Rob. Schomburgk, *Rapatea* Frid. Aug. Saxo-Frid. Reg. 13. 1845.

Peduncles solitary, axillary; involucral bracts spathaceous, foliaceous, bivalved, the margins often connate, therefore often saccate; inflorescence at maturity globose or hemispheric; spikelets numerous, sessile, or with very short stalks, irregularly subtended by several conspicuous or inconspicuous membranous bracts; sepals free to the base; petals obovate or suborbicular, at anthesis the claws connate into a conspicuous membranous tube; filaments adnate to the corolla tube, the anthers lanceolate, transversely rugose, tapered upwards, 4-lobed, the anterior locules extending to subterminal anterior pores, the posterior locules projected as a somewhat cucullate appendage; ovary trilocular, the locules pluriovulate; style subulate-trigonous, acute; stigma terminal, minute; capsule oblong-obovate, membranous below, indurate above, loculicidal, the placentation axial, the distal portion of the axis interrupted and the septa withdrawn to the walls; seed semi-annulate transversely rugose and striate.

Robust perennial herbs; a genus of nine species, five belonging to subg. *Eusaxofridericia*, confined to montane regions of the Guayana Highland, and the other four to subg. *Acrotheca*, these being plants of periodically inundated regions of lowland Hylean rain-forests, two within Guayana, two extra-Guayanan.

Type species: *Saxofridericia regalis* Rob. Schomb.

Key to the Species and Subspecies of *Saxofridericia*

1. Bractlets of the spikelets lanceolate or ovate-lanceolate, gradate; mature heads massive, 4 cm or more broad; plants of montane habitats (subg. *Saxofridericia*).
  2. Petioles lacking, i.e. the leaf-blade emerging directly from the summit of the leaf-sheath.
    3. Peduncles gradually enlarged below the inflorescence.
      4. Secondary bracts (enclosed by the primary involucral bracts) numerous, membranous, inwardly decreasing in size, the outer lanceolate, acuminate, 4–5 cm long; plants of the eastern Guayana Highland. 1. *S. regalis.*
      4. Secondary bracts (exclusive of spathaceous bracts) lacking, or inconspicuously small, membranous, and chaff-like; plants of the western Guayana Highland. 2. *S. duidae.*
        5. Spikelets 20–22 mm long; bractlets' maximum size 5 × 14 mm with the acumen ca. 0.5 mm long, the nerves 7, inconspicuous. *S. duidae* subsp. *duidae.*
        5. Spikelets 18 mm long; bractlets' maximum size 3 × 12 mm with the acumen ca. 1.0–1.5 mm long, the nerves 7-9, conspicuous. *S. duidae* subsp. *marahuacensis.*
    3. Peduncles abruptly enlarged and bulbose (in broad outline) below the inflorescence; plants of the western Guayana Highland.
      6. Peduncles strongly and sharply compressed, the margins very acute or narrowly winged; leaf-sheaths not spongiose, 4–5 cm broad; leaf-blades 4–5 cm broad; spikelets 20–24 mm long; petals broadly obcordate, 25–30 mm broad. 3. *S. compressa.*
      6. Peduncles moderately compressed, without winged or sharp margins; leaf-sheaths thickly spongiose, 8–10 cm broad; leaf-blades 7–10 cm broad; spikelets 26–32 mm long; petals rhomboid-orbicular, 18–20 mm broad. 4. *S. spongiosa.*
  2. Petiole 10–15 cm long, connecting the summit of the gibbose, lanceolate leaf-sheath and the blade proper; plants of the western Guayana Highland. 5. *S. grandis.*

1. Bractlets of the spikelets spathulate-oblanceolate, subequal in length, hence non-gradate; mature heads smaller, 3 cm or less broad; plants of lowland habitats (subg. *Acrotheca* Körn.).
  7. Leaf margins (and petioles) entire.
    8. Caudex free of marcescent leaf-sheaths; petioles lacking or shorter than the blade, the blades not subsucculent, obviously veined; bracteoles ca. 16, 8–9 mm long; sepals 11–12 mm long, not strongly bilaterally asymmetrical; ovary 4 mm long, the locules 6-ovuled. 6. *S. inermis.*
    8. Caudex fibrous with marcescent leaf-sheaths; petioles conspicuously longer than blades, the blades subsucculent, not obviously veined; bracteoles 20–22, 9–10 mm long, not conspicuously scarious-margined; sepals 14–15 mm long, strongly bilaterally asymmetrical; ovary 5 mm long, the ovules 6–10 per locule. 7. *S. petiolata.*
  7. Leaf and petiole margins dentate-spinulose.
    9. Base of the blades acutely narrowed into the petiole; margins of the blades more or less conspicuously dentate-spinulose. 8. *S. aculeata*
    9. Base of the blades subcordate or abruptly contracted into the petiole; margins of the blades usually less conspicuously spinulose, or one or both margins entire. 9. *S. subcordata.*

1. **Saxofridericia regalis** Rob. Schomb. *Rapatea* Frid. Aug. Saxo-Frid. Reg. 14. 1845.

Rapatea viscosa Gleason, Bull. Torrey Club **56:** 18. 1929.

Type: "Wächst auf sumpfigen Savannen in der Nähe des Sandsteingebirges der Roraima [Venezuela] 4000–5600 Fus über dem Meere," *Rob. Schomburgk 203S* (holotype, K).

Distribution: Freqeunt, savannas and open scrub slopes on sandy soil overlying Roraima sediments; Gran Sabana, Edo. Bolívar, Venezuela; Ayanganna, Imbaimadai, and Kaieteur Savannas, Pakaraima Region British Guiana; Tafelberf, Suriname.

2. **Saxofridericia duidae** Maguire, sp. nov.

Herbae magnae perennes; caulibus perbrevibus crassis percarnosis 1–2 dm altis erectis vel adscendentibus; foliis nonnullis, 10–20 dm longis; vaginis 20–30 cm longis, 3 cm latis, conduplicatis equitantibus distichisque induratis lanceolatis dorso carinatis laminarum marginibus continuis; laminis 8–18 dm longis, 2.0–3.5 cm latis, gladiatis falcato-acuminatis, ad basim longe et anguste attenuatis, supra nervis prominulis, subtus nervis ca. 20, plus-minusve prominentibus; costa valde prominenti; pedunculo solitario pseudosubterminali 6–10 dm longo et ad apicem dilatato; inflorescentia globosa, 4.5–5.5 cm diam; bracteis involucralibus 2, bivalvatis, brevicaudatis, 3–5 cm longis, brevi tempore ruptilibus, in maturitate nonvisis; spiculis numerosis sessilibus, 18–23 mm longis, in sepalis inclusis; bracteolis ca. 20, valde gradatis, inferioribus lanceolatis, ca. 6 mm longis, acutis 1-nervatis, superioribus lanceolatis pungentiacuminatis 7–9 nervis, apice rigido; sepalis liberis, 15–16 mm longis, lanceolatis acuminatis rigidis induratis 7–9-venatis, ad basim membranaceis; petalis obovatis apiculatis unguibus sparse pilosis (maturis non visis); filamentis membranaceis partibus liberis sursum, ca. 3 mm longis, 0.7–0.8 mm latis, 1-nervatis; antheris lanceolatis, ca. 6 mm longis, 4-lobatis 4-thecatis, thecis anterioribus ca. 5 mm longis, apice loborum posteriorum in appendice acuminato 1 mm longo producto; ovario triloculari, loculis pluriovulatis, nec capsulis nec seminibus visis.

Saxofridericia duidae subsp. **duidae.**

Spiculae 20–22 mm longae; mensura maxima bracteolarum 5 × 14 mm, acumine ca. 0.5 mm longo, nervis 7, inconspicuis.

Type: flowers yellow, frequent in woodland opposite ridge summit, Culebra Creek drainage at 1500 m alt., Cerro Duida, Terr. Amazonas, Venezuela, Nov 19, 1950, *Maguire, Cowan & Wurdack 29561* (holotype NY). Paratype: open slopes near summit Culebra Peak, Cerro Duida, at 1800 m alt., April 3, 1949, *Maguire & Maguire 29122.*

Distribution: of frequent occurrence on open slopes, woodlands on the northern part of Cerro Duida. Not collected on the adjacent Cerro Huachamacari.

Saxofridericia duidae subsp. **marahuacensis** Maguire, subsp. nov.

Spiculae 18 mm longae; bracteolis maximis 3 × 12 mm, acumine 1.0–1.5 mm longo; nerviis 7–9, conspicuis.

Type: open ridge southeast slopes of Cerro Marahuaca, at 1200 m alt., Terr. Amazonas, Venezuela, May 10, 1949, *Maguire & Maguire 29205* (holotype NY). Paratype: "an den zuflüssen des Orinoco auf dem Berg Warima" *Rob. Schomburgk 204 S* (K, photo NY; BM, photo NY).

Distribution: Known only by the type collections from Cerro Marahuaca and "den Berg Warima," probably Cerro Marahuaca.

3. **Saxofridericia compressa** Maguire, sp. nov.

Herbae perennes 1.5–2.5 m altae; caudice aliquantum rotundato nec compresso nec conspicue sigmoideo; vaginis 30–40 cm longis, 4–5 cm latis conduplicatis, subinduratis; laminis 1–2 m longis, 4–5 cm latis, minute subtus punctatis, venis inconspicue numerosis ca. 0.5 mm separatis, apice gradatim vel attenuate acuto, saepe falcato; pedunculo axillari, 10–18 dm longo, 10–15 mm diam., valde compresso, marginibus acutis vel subalatis, conspicue bulbose expansis subtus inflorescentia, basi bibracteato, bracteis 15–30 cm longis, lineari-lanceolatis, attenuate acutis, submembranaceis; inflorescentia solitaria bibracteata; bracteis involucralibus 6–10 cm longis, connatis, igitur saccatis, demum capite maturato ruptili; inflorescentia hemisphaerica vel oblongo-hemisphaerica ad basim truncata; receptaculo conico, 1–2 cm longo, multifloro; spiculis 50–80, fusiformibus, 20–24 mm longis (sepalis inclusis), bracteolis ca. 18, valde gradatis late lanceolato-acuminatis, inferioribus ovatis, 10–18 (20) mm longis, 6–10 mm latis, induratis, ad basim subscariosis, inconspicue 7–9-nervatis; sepalis 22–24 mm longis, ca. 10 mm latis, lanceolatis, valde acuminatis, induratis, ad basim membranaceis, 11–13-nervatis; petalis luteis puris, ad basim liberis, ungue 8–10 mm longo, 6–7 mm lato, lamina late obcordata et breviacuminata 25–30 mm lata ca. 2 cm longa; filamentis prope basim liberis, subulatis, ca. 10 mm longis, 1-nervatis; antheris 10–12 mm longis, valde transverse corrugatis, dehiscentibus introrse uno poro laterali subapicali, appendice ca. 0.75 mm longo; ovario triloculari, loculis pluriovulatis; stylo filiformi, 22–24 mm longo; stigmate minuto terminali; nec capsulis nec seminibus visis.

Type: perennial herb 2 m high, flowers yellow, petals obcordate, 3 × 3 cm, peduncles much compressed, frequent in low-bush slopes near Cumbre Camp at 1700 m altitude, Jan 4, 1954, Cerro de la Neblina, headwaters Río Yatua-Pacimoni, Territorio Amazonas, Venezuela, *Maguire, Wurdack & Bunting 37054* (holotype NY).

Paratypes: Cerro Neblina: *Maguire, Wurdack & Bunting 36842,* upper escarpment slopes, east Camp III, 1700–1800 m alt., Dec 24, 1953; the same, Dec 27, 1953, *36939;* West Escarpment 8 km n Cumbre Camp, frequent at 1900 m alt., Jan 10, 1954, *37172;* south slopes Caño Grande, vic. Cumbre Camp at 1500 m alt., Jan 16, 1954, *37322.*

Widely distributed on the summit of Cerro de la Neblina; from elsewhere unknown.

4. **Saxofridericia spongiosa** Maguire, sp. nov. Figure 4.

Herbae perennes 2–3 m altae; caudice aliquantum rotundato nec compresso nec conspicue sigmoideo; vaginis 30–35 cm longis, 8–10 cm latis conduplicatis, crasse spongiosis, in sicco conspicue transverse rugosis; laminis 1.5–3.5 m longis, 7–10 cm latis, subtus delicate et dense punctatis, apice gradatim vel attenuate acuto, saepe falcato, reticulate venatis, venis primariis 1–3 mm separatis; pedunculis duobus, bracteis submembranaceis 15–30 cm longis subtentis, pedunculo 8–12 dm longo, ca. 15 cm lato, aliquantum compresso sed non acute compresso, conspicue bulbose subtus inflorescentia expanso; inflorescentia hemisphaerica solitaria bibracteata; bracteis involucralibus 8–10 cm longis, 4–5 cm latis connatis igitur saccatis, demum capite maturo ruptili; receptaculo ovato vel hemisphaerico 15–20 mm demum 35 mm longo, multispiculato; spiculis 60–100, fusiformibus, 26–32 mm longis, sepalis inclusis; bracteolis 6–18, gradatis, oblongo-oblanceolatis acuminatis, 14–20 mm longis, 4–6 mm latis, 5–9-nervatis sursum subinduratis, deorsum subscariosis; sepalis 25–28 mm longis, 6–8 mm latis, lanceolato-acuminatis, induratis, et valdius 9–11-nervatis sursum, ad basim scariosis; petalis liberis, ungue 20–22 mm longo, 4–5 mm lato, lamina rhomboideo-orbiculari vel ovato-orbiculari, minute acuminata 18–20 mm lata; filamentis ca. 20 mm longis; antheris ca. 18 mm longis, valde transverse rugosis; stylo ca. 3 cm longo, stigmate minuto terminali; ovario triloculari, loculis pluriovulatis; capsula ovali-oblonga ca. 1 cm longa.

Type: perennial herb to 3 m high, sheaths conspicuously spongy, petals ovate rhomboid; frequent, granitic slopes, Cerro Arauicaua, alt. 120–200 m, Río Yatua-Pacimoni, Amazonas, Venezuela, Feb 4, 1954, *Maguire, Wurdack & Bunting 37485* (holotype NY). Paratype: perennial herb with leaves to 3.5 m long, flowers yellow, scapes and leaves glaucous, frequent, granitic slopes, Cerro Arauicaua, *Maguire, Wurdack & Bunting 37474*.

Known only from Cerro Arauicaua, where this handsome herb is a conspicuous plant of the open granite slopes. It is the only species of the subgenus *Saxofridericia* known to occur at low altitudes and elsewhere than on sandstones of the Roraima Sediments.

5. **Saxofridericia grandis** Maguire, sp. nov. Figure 4.

Herbae perennes ca. 2 m altae; caudice ad 3 dm longo; vaginis coriaceis induratis, gibboso-lanceolatis, 15–20 cm longis, 5–7 cm latis, conduplicatis, marginibus late submembranaceis; petiolis 15–20 cm longis; laminis linearibus, 7–10 dm longis, 4.0–5.5 cm latis; nervis a 0.5 mm separatis; pedunculo aliquantum compresso glauco, gradatim expanso subtus inflorescentia; inflorescentia hemisphaerica; bracteis involucralibus ovato-lanceolato-acuminatis, 7–10 cm longis, connatis saccatis demum capite maturo ruptili; spiculis numerosis 50–80, 25–30 mm longis; bracteolis 10–15, exterioribus anguste lanceolatis, 20–22 mm longis, ca. 4 mm latis, interioribus oblongo-lanceolatis, abrupte acuminatis, 16–18 mm longis, 6–7 mm latis, subinduratis; sepalis oblongo-lanceolatis et acuminatis induratis, 22–26 mm longis, 8–10 mm latis; petalis staminibusque non visis; seminibus semiannulatis transverse rugosis et striatis, canis, 4–5 mm diam.

Type: herbaceous perennial 2 m high, caudex to 3 dm high, flowers yellow, copious gelatin at base of leaves; frequent, cumbre at head of Caño, Cerro Parú, at 2000 m alt., Río Parú, Río Ventuari, Amazonas, Venezuela, Jan 31, 1951, *Cowan & Wurdack 31115* (holotype NY). Paratypes: Cerro Parú: occasional,

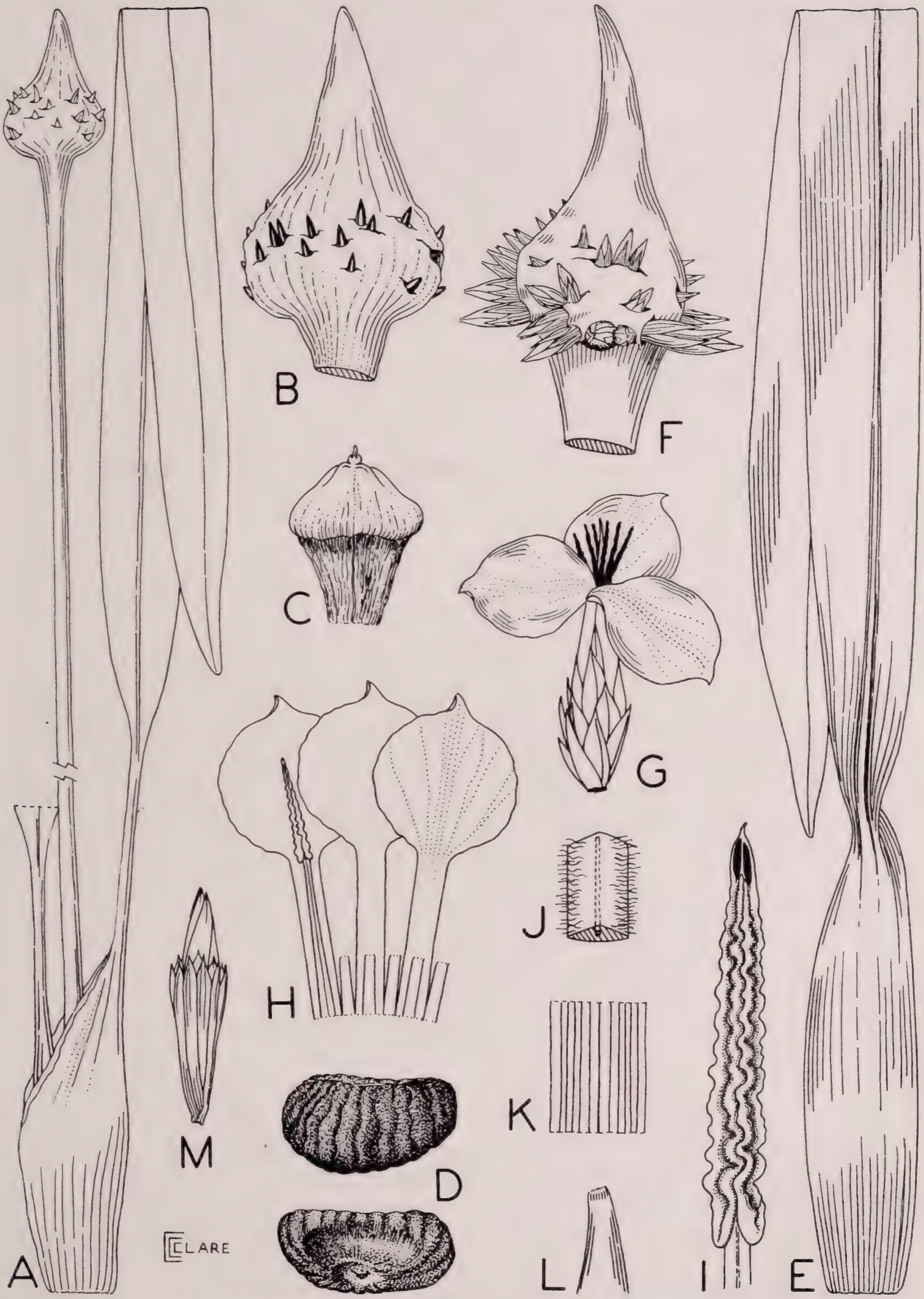


FIG. 4. A–D, *Saxofridericia grandis.* A, habit, × ¼; B, inflorescence, × ½; C, capsule, × 3; D, seed, dorsal and ventral view, × 5; from *Cowan & Wurdack 31115.* E–L, *Saxofridericia spongiosa.* E, leaf, × ⅙; F, inflorescence, ×½; G, spikelet, × 1; H, corolla, spread out, × 1; I, anther, × 5; J, median section of filament, × 10; K, median section of claw of petal, × 1½; L, stigma, × 15; drawn from *Maguire, Wurdack & Bunting 37485.* M, *Saxofridericia petiolata,* spikelet, × 2; drawn from *Maguire 29325.*

sabanita and scrub forest, cumbre at 2000 m alt., Feb 2, 1951, *Cowan & Wurdack 31193;* Feb 4, 1951, *Cowan & Wurdack 31235.*

A remarkably distinct species known only from Cerro Parú.

6. **Saxofridericia inermis** Ducke, Arch. Inst. Biol. Veg. Rio. 4: 1. 1938.

Type: planta usque ad 1.5 m alta, flor. luteis, ad ripas arenosis locis paludosis, super cataractas Rio Curicuriary affl. Rio Negro, civit. Amazonas, Brazil. Nov. 23, 1936, *A. Ducke Herb. J. B. R. J. 35594* (holotype RB, isotypes NY, US).

Distribution: Riverine banks, woodland subject to periodic inundation, drainage of the Rios Negro and Casiquiare, Brazil, Colombia, and Venezuela.

7. **Saxofridericia petiolata** Maguire, sp. nov.

Herbae perennes robustae; caudice cum vaginis foliorum marcescentibus fibroso; laminis 1.5–3.0 m longis; vaginis 15–20 (25) cm longis, 3 cm latis conduplicatis, conspicue scariosomarginatis, ad basim late dilatatis; petiolis vulgo quam laminis duplo longioribus; laminis 15–20 mm latis, subsucculentis, venis improminulis; pedunculo solitario, 1.5–2.5 m longo, tenui aliquantum compresso, gradatim crassato, sursum 8–10 mm crasso; inflorescentia hemisphaerica vel subglobosa, 2.5–3.0 cm lata; bracteis involucralibus connatis; spiculis 50–80, 14–16 mm longis, sepalis inclusis; bracteolis 20–22, 9–10 mm longis, subaequalibus, spathulatis, oblanceolatis, acute breviacuminatis, marginibus anguste scariosis; sepalis 14–15 mm longis, lanceolatis valde bilateraliter asymmetricis; petalis antherisque non visis; ovario 5 mm longo; ovulis 6–10 in loculo; seminibus non visis.

Type: perennial herb to 3 m high, frequent in recently flooded thickets of bamboo and palm, on white sand, Río Temi, Río Atabapo, Terr. Amazonas, Venezuela, Oct 19, 1950, *Maguire 29320* (holotype NY). Paratype: marshy thickets in scrub savanna about "laja" 4 hr. below Yavita, Río Temi, Oct 19, 1950, *Maguire 29325.*

8. **Saxofridericia aculeata** Körnicke, Linnaea 37: 457. 1872.

Saxo-Fridericia australis Gleason, Bull. Torrey Club 60: 350. 1933.

Type: in vallibus paludosis umbrosis et in aquosis inter Couana et Aprouague, Guiana gallica, *L. C. Richard s.n.* (holotype P).

Distribution: marshes or swamps in rain-forest, Suriname, French Guiana, and Pará, Brazil.

9. **Saxofridericia subcordata** Körnicke, Linnaea 37: 459. 1872.

Rapatea pandanoides Linden & André, Ill. Hort. 20: 213. *pl. 153, 154.* 1873.

Type: moist forest, Barra, only one plant found, July 1851, *Spruce 1724* (holotype P, isotype K).

Distribution: marshy or swampy rain-forest, Amazonas, Brazil.

2. **Phelpsiella** Maguire, gen. nov.

Capitulum parvum valde compressum bispathatum; spathis orbiculari-obovatis, adpressis erectis, marginibus primo conatis, paucifloris; spiculis sessilibus, bracteolis gradatis; antheris bithecatis, non muriculatis, biporatis, poris rotundis apicalibus; ovario triloculari, loculis pluriovulatis, ovulis axi medio affixis.

Herbae parvae foliis linearibus equitantibus basilaribus, pedunculis subterminalibus solitariis. Genus monotypicum.

Typus: *Phelpsiella ptericaulis* Maguire.

Dr. William H. Phelps, Mr. William H. Phelps, Jr., and Kathleen D. Phelps (Mrs. W. H. Phelps, Jr.) are all internationally known ornithologists and natural historians. In 1937 the elder Phelps organized and sponsored the history-making expedition to Auyán-tepuí, ably led by G. H. H. Tate of the American Museum of Natural History, the plants of which came to The New York Botanical Garden. Before the exploration of Auyán-tepuí and continuously since, the Phelps have sent out and have themselves conducted ornithological expeditions to all parts of Venezuela, particularly to Guayana. On most of these explorations Kathleen Phelps in addition to her other duties has collected much critical plant material from equally critical localities. On the expedition to Cerro Parú, Kathleen Phelps with C. H. Hitchcock, now Director of The American Geographical Society, obtained the type material upon which *Phelpsiella* is based. It is eminently fitting that our extraordinary new genus should bear the Phelps' name.

Phelpsiella ptericaulis Maguire, sp. nov.

Herbae perennes parvae; caudicibus succulentis brevissimis erectis; vaginis 18–25 cm longis, distichis, plus minusve equitantibus marcescentibus, basi subbulbosa, submembranaceis subtiliter nervato-striatis, auriculis prominentibus erectis ovatis 7–8 mm longis, ca. 8 mm latis, basi obliqua; laminis linearibus subcoriaceis, 40–45 cm longis, 8–16 mm latis, acutiusculis, nervis 11–13, infra prominulis subtus prominentibus, minute punctatis; pedunculo solitario subterminali valde acuteque compresso, 20–30 cm longo, 3–5 mm lato, apicem versus late alato, 10–12 mm lato; bracteis bivalvatis, spathaceis orbiculari-obovatis vel oblongis rotundatis, 12–20 mm longis, 12–14 mm latis, apicem versus recurvatis, extus absolutis, intus prominentibus, 5–7-nervatis; spiculis 2–4, sessilibus, bracteolis 13–14, oblongo-lanceolatis obtusis apice crassatis, gradatis enervatis, exterioribus 6–7 mm longis, ca. 4 mm latis, interioribus 9–10 mm longis, ca. 3 mm latis; sepalis lanceolatis obtusis, 12–14 mm longis, indurato-chartaceis, 7-nervatis, ad basim membranaceis 3–4 mm, connatis per 0.5–1.0 mm, marginibus deorsum ab apice late membranaceis; petalis 2.0–2.5 cm longis, oblanceolatis rotundatis breviacuminatis, ca. 4.5 mm latis, unguibus 3–4 mm longis, per 2–3 mm connatis; filamentis ca. 5 mm longis, tubo corollae affixis; antheris bithecatis, 4-lobatis, ad apices biporis, ca. 8 mm longis; ovario 3-loculari, loculis pluriovulatis; seminibus subprismaticis,, 1.5–3.0 mm latis, 1.75–2.0 mm longis, rufo-bruneis, testa exteriore scariosa valde alveolata.

Type: small herb with yellow flowers, very abundant, mostly in open areas, summit Cerro Parú at 1600 m alt., Feb 11, 1949, Terr. Amazonas, Venezuela, *Phelps & Hitchcock 518* (holotype NY). Paratypes: Cerro Parú, 2000 m alt., *Cowan & Wurdack* in 1951: Jan 31, *31058;* Feb 2, *31172;* Feb 4, *31251;* Feb 7, *31373, 31352.*

Known only from the Serrania Parú, where it appears to be common. The collectors note that rootstocks develop offshoots and apparently form colonies by vegetative multiplication. The leaves are described as appearing blue by reflected light, a phenomenon often observed in the Rapateaceae.

Phelpsiella is a monotypic reductive genus, possibly most nearly related to *Amphiphyllum.*

3. **Amphiphyllum** Gleason, Bull. Torrey Club **58:** 332. 1931.

Cephalar bracts several, the exterior two spathaceous, rigid, more or less valvate and connate; spikelets few, sessile; anthers 4-locular, dehiscing by a laterally subapical pore, the anterior anther cells produced into an appendage; ovary 3-celled, each cell pluriovulate.

Type: *Amphiphyllum rigidum* Gleason.

Key to the Species of *Amphiphyllum*

1. Leaves 4–10 mm broad, strongly nerved; outer cephalar bracts lanceolate, 3–4 cm long; inner bracts rigid, narrowly lanceolate. 1. *A. rigidum.*

1. Leaves 25–30 mm broad, inconspicuously nerved; outer cephalar bracts broadly orbicular-obovate, ca. 2 cm long; inner bracts membranous, conduplicate. 2. *A. schomburgkii.*

1. **Amphiphyllum rigidum** Gleason, Bull. Torrey Club **58:** 333. 1931.

Type: in swamp on the slopes of Savanna Hills, summit of Mount Duida, Amazonas, Venezuela, alt.: 4400 ft, *G. H. H. Tate 780* (holotype NY).

Additional specimens: summit Cerro Duida, alt. 1700–1980 m, Sept 1, 1944, *Steyermark 58175* (F, VEN); summit Cerro Duida, alt. 1025–1200 m, Sept 2, 1944, *Steyermark 58249* (F, NY, VEN). Known only from Cerro Duida.

2. **Amphiphyllum schomburgkii** Maguire, sp. nov.

Herbae perennes; foliis gladiatis, laminis 60–70 cm longis, 2.5–3.0 cm latis, moderate nervatis, apicibus acutis; vaginis non visis; scapis evidenter pluribus, angulato-sulcatis, 2.0–2.5 mm diam., superne expansis compressis, 4–6 mm latis; capitulis vulgo 6–8-floris; bracteis primariis duobus, induratis, exteriore late orbiculari, obovata, ca. 2 cm longa, interiore obovata, angustiore, partim amplectanti exteriorim; bracteis secondariis delicatis membranaceis 2–3-floris vaginatis; bracteis tertiariis similibus, acutis, 15–18 mm longis, flore quoque a bractea subtento et vaginato; spiculis 6–8, sessilibus, 14–15 mm longis, sepalis exclusis; bracteolis 5–6-seriatis gradatis, lanceolatis induratis acutis, enervatis, conspicue scario-marginatis; sepalis induratis, lanceolatis acutis, exsertis, ca. 15 mm longis, ca. 5 mm latis; petalis non bene visis; antheris ca. 9 mm longis, 4-thecatis; seminibus ignotis.

Type: *R. H. Schomburgk 1055,* without definite locality (holotype BM, isotypes K, NY). Known only by the type collection.

Robert Schomburgk's mss. field notes (preserved at Kew, typescript copy at New York) end with No. *1054* which was collected "on moist savannas near Roraima." It does not necessarily follow that No. *1055,* the type of *Amphiphyllum schomburgkii* was obtained at the locality of *1054,* since the order of Schomburgk's numbered series is not always in chronological or geographical sequence. I strongly suspect that *1055* was collected on or near Cerro Marahuaca, in Amazonian Venezuela. Its only congener, *A. rigidum* Gleason, is known solely from the nearby Cerro Duida. It would seem reasonable to assume that if this plant had been collected in the environs of Roraima it should have been rediscovered by some of the many subsequent botanical visitors to that region.

4. **Stegolepis** Klotzsch ex Körnicke, Linnaea **37:** 480. 1872.

The genus *Stegolepis,* like *Rapatea,* has evolved perhaps 20 species. But unlike the latter, which has a broad distribution chiefly extra-Guayanan and at low altitudes, *Stegolepis* is confined to the Roraima Sediments at relatively high (400–2000 m) elevations. Taxonomic consideration of this rather complex genus is to be presented in a forthcoming issue of the *Memoirs*.

5. **Epiphyton** Maguire, gen. nov.

Scapi numerosi axillares; capitibus ebracteatis, plurifloris; petalis lanceolatis, ad basim connatis; antheris bithecatis, ad apices duobus poris confluentibus dehiscentibus; ovario 3-loculari, loculis pluriovulatis, endocarpello indurato, exocarpello separato; seminibus depressis oblongis disciformibus, mediis apiculatis, testa nigra alveolata.

Herbae perennes epiphyticae rhizomate crasso elongato; vaginis foliorum latis distichis, submembraneis; laminis chartaceis.

Typus: *Epiphyton allenii* (Steyerm.) Maguire.

Key to the Species of *Epiphyton*

1. Peduncles subfiliform, 0.5–0.6 mm wide; heads 1–2 (3)-flowered; spikelets 11–12 mm long; anthers 3 mm long; seed 1.0–1.5 mm in diameter; under leaf-surface merely prominulously 12–14-nerved; plants of Panama. 1. *E. allenii.*
1. Peduncles relatively coarse, 1.0–1.4 mm wide; heads (3) 4–7-flowered; spikelets 8–9 mm long; anthers 2 mm long; under leaf-surface rather prominently 18–22-nerved; plants of Colombia. 2. *E. micranthera.*

1. **Epiphyton allenii** (Steyerm.) Maguire, comb. nov.

Stegolepis allenii Steyermark, Field Mus. Publ. Bot. **22**: 325. 1940.

Type: epiphytic, growing with orchids and ferns in tops of trees 10 m tall, hills north of El Valle de Anton, alt. 1000 m, prov. Coclé, Panama, June 23, 1940, *Paul H. Allen 2153* (F, isotype MO).

Additional specimen: Epiphytic herb resembling plants of *Iris germanica,* crest of Cerro Pajita, El Valle de Anton, alt. 1100 m, Prov. Coclé, Sept. 28, 1946, *Allen 3748* (MO).

The species is known only by the two cited specimens.

2. **Epiphyton micranthera** Maguire, sp. nov.

Herbae perennes epiphyticae; foliis 5–7, 4–6 dm longis, vaginis valde equitantibus distichisque, in uno plano dispositis, submembranaceis vel tenuiter chartaceis conduplicatis semilanceolatis, 10–12 cm longis, nervis prominulis, marginibus subscariosis, apice contracto, ligulo obsoleto; laminis chartaceis vel subcoriaceis, 30–45 cm longis, 18–26 mm latis, subtus aliquantum prominenter 18–22-nervatis, apice breviacuminato falcato; pedunculis 6–8 axillaribus, 1.0–1.5 mm crassis, 20–30 cm longis, quadrangularibus vel quadrilobatis, apice sursum dilatato; bracteis 2, brevissimis semiannularibus, scariosomarginatis, ca. 0.5 mm longis; spiculis (3) 4–7, sessilibus, 8–9 mm longis; bracteolis 12–14, valde gradatis subacutis, inferioribus ovatis asymmetricis, 1.5 mm longis, 1.25 mm latis, mediis ca. 4.5 mm longis, 1-nervatis vel enervatis, interioribus oblongo-lanceolatis, ca. 6.5 mm longis, 2.5 mm latis, 3-nervatis; sepalis 7–8 mm longis, 3 mm latis, induratis, lanceolatis acutis, 5-nervatis, basi per 1.5–2.0 mm connatis, membranaceis; petalis anguste lanceolatis attenuato-acuminatis, 10–12 mm longis, 1.0–1.5 mm latis, basi 1–2 mm (immaturis) connatis; filamentis ca. 6 mm longis ad basim corollae 2 mm adnatis; antheris ca. 1.8 mm longis bithecatis transverse ad apicem biporis; ovario triloculari indurato, ca. 6 mm longo, truncate subrhomboideo, endocarpello a exocarpello separato; loculis pluriovulatis; seminibus non visis.

Type: epiphyte, leaves rather thick, deep green, flowers yellow, alt. 70 m, Chuare, Dept. Cauca, Colombia, Dec 23, 1946, *Oscar Haught 5387* (US 1903798; Herb. Lehmannianum *s.n. s. dat.* K). No other collections are known to me.

This genus, because of general similarity of form and habit, must be considered to be an offshoot of the large Guayanan genus *Stegolepis*. Numerous clear-cut and distinctive differences suggest that the trans-Andean segregate, with its two greatly disjunct species, has been separated from its progenitor larger generic assemblage for geologically a long time.

Saxofridericioideae, Schoenocephalieae

6. Kunhardtia Maguire, gen. nov.

Inflorescentia hemisphaerica magna solitaria, bracteis bivalvatis involucralibus subtenta; spiculis rubris sessilibus, porrectis, inferioribus reflexis; bracteolis gradatis; sepalis ad basim liberis; petalis rubris lanceolatis valde exsertis ad basim connatis; antheris linearibus muriculatis bithecatis, poris duabus terminalibus annularibus dehiscentibus; ovario triloculari, loculis pluriovulatis; seminibus subpyramidalibus striatis, non appendiculatis.

Herbae terrestres perennes; foliis gladiatis linearibusque, pedunculo pseudoterminali solitario. Genus monotypicum.

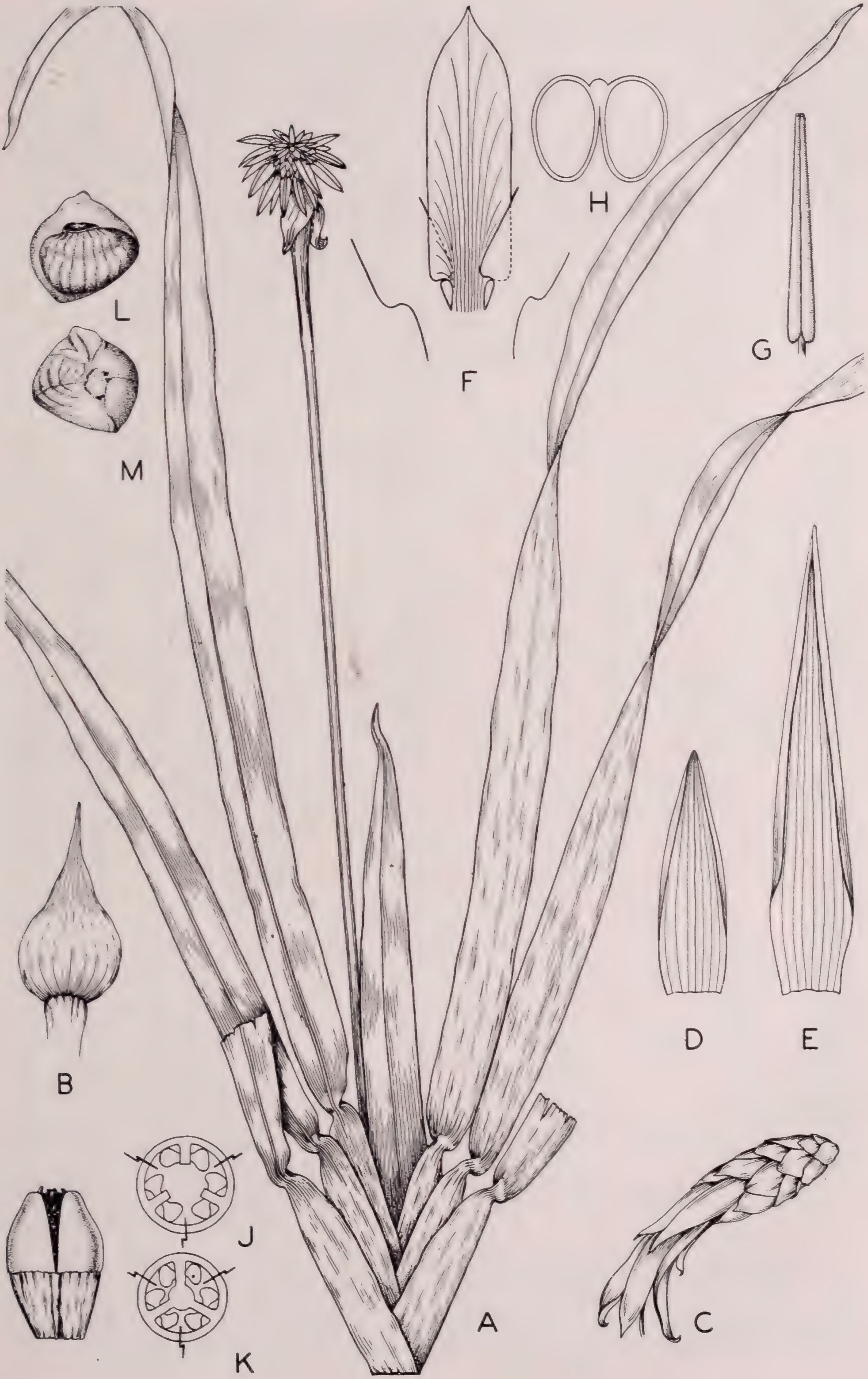
Typus: *Kunhardtia rhodantha* Maguire.

Mr. H. R. Kunhardt, before his recent retirement, had long been a resident of Venezuela and a student of its remarkable orchid flora. Outright he financed The New York Botanical Garden Expeditions in 1948 and 1949 to Cerros Sipopa and Marahuaca in remote Venezuelan Amazonas, and among his broad circle of acquaintances found support for the expedition of 1951 to Cerro Guaiquinima in Estado Bolívar. As President of the Venezuelan Petroleum Company he was instrumental, during a large part of our Guayana field work, in procuring for us from the Sinclair Oil Company transportation to and from Venezuela. Constantly by friendship and enthusiasm he has been a source of guidance and encouragement. It is a considerable satisfaction to dedicate this handsome new genus to him.

Kunhardtia rhodantha Maguire, sp. nov. Figures 5, 6.

Herbae perennes terrestres; caulibus succulentis, crassis, 1–3 dm longis; foliis 3–7, 7–14 dm longis, vaginis valde distichis equitantibusque, in uno plano dispositis, coriaceis, 15–25 cm longis, conduplicatis, 3.5–5.5 cm latis, extus laevigatis enervatis exauriculatis eligulatis; laminis 5–12 dm longis, 4–5 cm latis, linearibus, subtiliter multinervatis, apice falcato-acuminato subobtuso; peduncelo pseudoterminali solitario, 7–12 dm longo, 7–10 mm lato, ad apicem valde dilatato et compresso, 2 cm lato; inflorescentia depresso-globosa, 7–8 cm diam.; bracteis involucralibus spathulatis bivalvatis ovato-acuminatis, 5–6 cm longis, 3–4 cm latis, maturis reflexis; receptaculo conico, ca. 2 cm alto; spiculis vulgo 50–60, sessilibus, porrectis, inferioribus reflexis, 3–4 cm longis, sepalis inclusis; bracteolis 16–20, valde gratatis, purpureo-rubris, apice rubrimaculato, inferioribus late ovatis, ca.

FIG 5. A–M, *Kunhardtia rhodantha*. A, habit. ×1/6; B, young inflorescence, showing saccate connate involucral bracts, ×½; C, spikelet with exserted corolla lobes, × 1; D, upper bracteole, × 2; E, sepal, × 2; F, diagrammatic representation, portion of spread-out corolla, × 1½; G, anther, × 2; H, cross section of anther, × 10; I, mature capsule, × 2; J, diagrammatic cross section through upper ⅓ of capsule, × 2; K, through lower ⅓ of capsule, × 2; L, seed, lateral view, × 5; M, seed, basal view showing attachment scar; drawn from *Maguire & Politi 28195*.


L
M
H
G
F
B
D
E
J
K
A
C

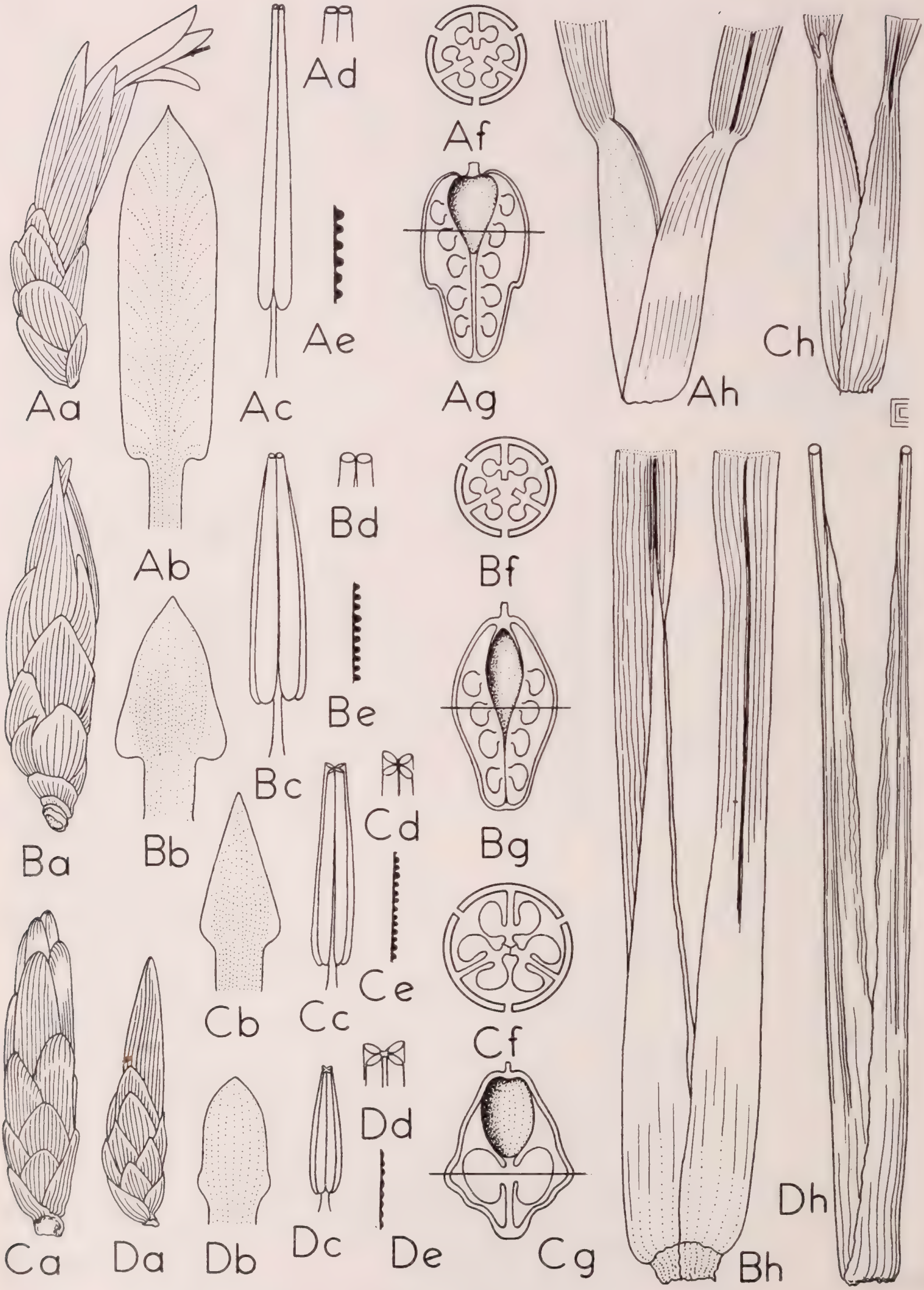

Aa
Ab
Ac
Ad
Ae
Af
Ag
Ah
Ch
Ba
Bb
Bc
Bd
Be
Bf
Bg
Bh
Ca
Cb
Cc
Cd
Ce
Cf
Cg
Da
Db
Dc
Dd
De
Dh

FIG. 6. Aa–Ah, *Kunhardtia rhodantha.* Aa, spikelet showing exserted corolla, × 1¼; Ab, petal, × 2; Ac, stamen, × 2½; Ad, apical pores of anther, × 5; Ae, detail of muriculate surface, anther, × 15; Af, cross-section diagram of capsule, upper ⅓, × 3; Ag, long-section diagram of capsule (position of cross section indicated), × 3; Ah, leaf-sheaths, × ¼; drawn from *Maguire & Politi 27954, 28195, 28703.* Ba–Bh, *Guacamaya superba.* Ba, spikelet, × 2½;

5 mm longis, 5 mm latis, saepe apiculatis, 5–7-nervatis, superioribus lanceolatis, ca. 20 mm longis, 5 mm latis, acutis, ad basim submembranaceis; sepalis 3, liberis, lanceolatis acutis rubritinctis, 30–35 mm longis, indistincte 9–11-nervatis, ad basim per 5 mm submembranaceis; corolla 35–45 mm longa, subcarnosa, purpureo-rubra, recurvo-porrecta aliquantum irregulari, petalis ad basim in tubo membranaceo per 10–15 mm connatis, sursum liberis, segmentis lanceolatis, naviculoideis, 20–35 mm longis, 6–8 mm latis, marginibus minute ciliolatis, multivenatis, basi auriculata, apice acuto; filamentis membranaceis, 0.6–0.8 mm latis, ad basim corollae per 10–15 mm adnatis, partibus liberis ca. 10 mm longis; antheris 17–18 mm longis, linearibus, muriculatis, bithecatis, ad apicem transverse biporis; ovario triloculari ad basim membranaceo sursum indurato, loculis pluriovulatis; seminibus subpyramidalibus, striatis, ca. 3 mm diam.

Type: common red-flowered perennial herb in open scrub savanna, Campo Grande, 1500 m alt., Jan 10, 1949, Cerro Sipapo, Amazonas, Venezuela, *Maguire & Politi 28195* (holotype NY).

Paratypes: VENEZUELA: Amazonas, Cerro Sipapo: on sandstone 1500–2000 m alt., *Maguire & Politi 27484, 27872, 27954, 28670;* on granite at 600 m alt., *Maguire & Politi 27400* and *28703;* Caño Fluta, 50 km s.e. Puerto Ayacucho at 200 m alt., *Maguire & Baumgartner 31834;* Cerro Guanay, at 1800 m alt., *Maguire, Phelps, Hitchcock & Budowski 31757;* Cerro Yutaje, *B. Maguire & C. K. Maguire 35200, 35227, 35400;* Cerro Coro-Coro, *Maguire & Maguire 35485.*

Distribution. *Kunhardtia rhodantha* is one of the more conspicuous plants on the cumbre of Cerro Sipapo, being widely and commonly distributed on open savannas, terraces, ridges, and summits from 1500 to 2000 m. It has been collected in similar habitats from Cerro Guanay and occurs quite commonly on Serranía Yutaje, all belonging to the Roraima complex in Venezuelan Amazonas north of the Ventuari River. At lower altitudes this striking species has been collected on granite on Cerro Sipapo at 700 m, and near Puerto Ayacucho at 200 m.

Among the *Schoenocephaleae, Kunhardtia* by its ample corollas and numerous ovules, more than its immediate congeners, occupies a primitive phyletic position. Its anthers, however, have become the most modified of any in the tribe.

7. **Guacamaya** Maguire, gen nov.

Inflorescentia hemisphaerica magna solitaria, bracteis involucralibus bivalvatis saccatis connatis non dehiscentibus subtenta; spiculis numerosis patentibus sessilibus spiraliter affixis; sepalis liberis; corolla inclusa, petalis ad basim connatis; filamentis ad basim adnatis; antheris bithecatis, biporis; ovario triloculari, loculis pluriovulatis; seminibus subprismaticis, striatis, non appendiculatis.

Bb, petal, × 3½; Bc, stamen, × 7½; Bd, apical pores of anther, × 10; Be, detail of muriculate surface, anther, × 15; Bf, cross-section diagram of capsule, upper ⅓ × 3; Bg, long-section diagram of capsule (position of cross section indicated), × 3; Bh, leaf-sheaths, × ¼; drawn from *Maguire, Wurdack & Bunting 36365, 36418,* and *Schultes, Baker & Cabrera 18187.* Ca-Ch, ***Schoenocephalium cucullatum.*** Ca, spikelet, × 2½; Cb, petal, × 3½; Cc, stamen, × 7½; Cd, apical pores of anther, × 10; Ce, detail of muriculate surface, anther, × 15; Cf, cross-section diagram of capsule, × 6; Cg, long-section diagram of capsule, × 6; Ch, leaf-sheaths, × ¼; drawn from *Maguire, Cowan & Wurdack 39486* and *Maguire, Wurdack & Bunting 37631.* Da–Dh, ***Schoenocephalium teretifolium.*** Da, spikelet, × 2½; Db, petal, × 3½; Dc, stamen, × 7½; Dd, apical pores of anther, × 10; De, detail of muriculate surface, anther, × 15; Dh, leaf-sheaths, × ¾; drawn from *Maguire & Wurdack 35600* and *Maguire, Wurdack & Bunting 36468.*

Herbae terrestres perennes, foliis linearibus, pedunculo pseudoterminali; caudice cum vaginis valde sigmoideis in sectionibus transversis. Genus monotypicum.

Typus: *Guacamaya superba* Maguire.

Guacamaya is the vernacular name applied to the plant because the vivid color of its inflorescence fancifully resembles that of the red macaw, the "guacamaya."

Guacamaya superba Maguire, sp. nov. Figure 6.

Herbae terrestres perennes, caudice 5–12 cm longo, vaginis in sectionibus valde sigmoideis; foliis 3–6, 8–10 dm longis, valde glaucis; vaginis anguste lanceolatis, 15–30 cm longis, 2–3 cm latis conduplicatis, coriaceis, valde distichis equitantibusque, marginibus anguste scariosis ad basim late dilatis, insensim in laminis extendentibus, ligulo dorso oblongo-ovato, 1.5–2.0 mm longo; laminis linearibus 5–7 dm longis, 2.0–2.5 (3.0) cm latis, costa in dorso conspicua, 4–5 mm lata, nervis prominulis a 0.2–0.3 mm separatis, apicibus anguste falcato-acuminatis; pedunculo solitario, 10–12 dm longo, ca. 6 mm diam., ad apicem dilatato et compresso, 12–18 mm lato; inflorescentia hemisphaerica vel subglobosa, ad basim truncata; bracteis involucralibus bivavlatis, saccato-connatis, ovato-lanceolatis, 2.5–3.0 cm latis, 4.0–4.5 cm longis, non dehiscentibus, non deflexis, ab spiculis maturis expansis perforatis ruptisque; spiculis inferioribus patentibus aliquantum reflexis, ca. 2 cm longis; bracteolis ca. 20, gradatis, roseotinctis, inferioribus 3–5 mm longis, scariosis, late ovatis, acutis, 3-nervatis, mediis 6–10 mm longis, 5–6 mm latis, late lanceolatis acutis, subscariosis, superioribus 10–15 mm longis, ca. 5 mm latis, lanceolatis acutis ad apicem subinduratis 5-nervatis; sepalis liberis, ca. 5–6 mm latis, 18–22 mm longis, lanceolatis acutis, ad basim scariosis, 7–9 nervatis, ad apicem induratis naviculoideis; corolla in sepalis inclusa 12–14 mm longa, petalis ad basim in tubo 3–4 mm longo connatis, sursum liberis, limbis lanceolatis sagittatis ca. 8–9 mm longis, minutissime ciliolatis subcarnosis evidenter albo-flavidis; filamentis ad basim in tubo 3–4 mm longo connatis et petalis adnatis, partibus liberis 1–2 mm longis membranaceis; antheris 4–5 mm longis quadrilobatis bithecatis, ad apicem transverse biporis, ad basim minute sagittatis; ovario triloculari, loculis 8-ovulatis; style 8–10 mm longo, tereti, ad apicem truncato circumciliato, ciliis ca. 0.25 mm longis; seminibus subprismaticis, ca. 1.5–2.0 mm longis, striatis, testa scariosa alveolata.

Type: perennial herb to 1.5 m high, strongly sigmoid at base, lower surface of leaves and peduncles glaucous, old sheaths marcescent for 2–3 dm, spathaceous bracts ruptured by expanding head; spikelets spirally aranged, bracteoles red, sepals flesh-colored, petals whitish, abundant, marshy savana, Sabana Venado, Caño Pimichín at 140 m alt., Río Guainía, Amazonas, Venezuela, April 14, 1953, *Bassett Maguire & John J. Wurdack 35634* (holotype NY).

Paratypes: frequent in wet sabanita 1 km east Maroa, Río Guainía, 125 m alt., April 17, 1953, *Maguire & Wurdack 35722;* inflorescence up to 6 ft tall, Puerto Colombia (opposite Maroa, Venezuela), Río Guainía, Vaupés, Colombia, Oct 21–Nov 2, 1952, *Schultes, Baker & Cabrera 18187* (NY); Maroa, Feb 17, 1942, *Williams 14389* (US); Sabana Venado, Caño Pimichín, Río Guainía, *Maguire & Wurdack 35619;* caudex twisted, outer bracteoles coral-red, inner cream, sepals white, abundant, savanna edge, Sabana Venado, Caño Pimichín, Nov 23, 1953, *Maguire, Wurdack & Bunting 36365, 36366;* Maroa, Nov 25, 1953, *Maguire, Wurdack & Bunting 36418.*

Distribution: *Guacamaya superba* is the low-altitude correlative of the likewise monotypic *Kunhardtia.* Thus far *Guacamaya* has been obtained only from the region of the Río Guainía in both Venezuela and Colombia.

8. Schoenocephalium Seub. Fl. Bras. 3¹: 130. 1847; emend. Maguire.

The genus *Schoenocephalium* as presented by Seubert in the *Flora brasiliensis* was based on two collections obtained by Martius in savannas near "montis Arara-Coara" (Araracuara), Río Caquetá, Amazonas, Colombia. These became the types, respectively, of the two species proposed by Seubert, viz., *S. martianum* and *S. arthrophyllum.* The latter, however, belongs to the very distinct and unrelated genus *Monotrema* established by Körnicke[12] years later.

Both of these collections have been in my hands for the purpose of this study.

It is clear that the generic description of *Schoenocephalium* as drawn up by Seubert (so noted by Körnicke l.c.) was largely based on the structural characters of the types of *S. martianum,* the specimens of which are in early anthesis. Apparently only the characterization "Semina subglobosa, ... interdum appendiculata," applies to the types of Seubert's *S. arthrophyllum* in which mature seed are present.

The generic description of *Schoenocephalium* must thus be emended to rectify the errors of the original diagnosis, and *S. arthrophyllum* must, in the proper place, be transferred to *Monotrema.*

Heads globose, bibracteate; spikelets radiate; bracteoles gradate; sepals free to the base; petals lanceolate, included within the sepals which do not open during anthesis, claws connate; stamens 6, the filaments adnate to the corolla-tube; anthers 4-celled, the apex cruciform, 4-porous, sometimes the lateral pores becoming confluent; ovary trilocular, each locule biovulate (4-ovulate in *S. schultesii*)*;* styles terete, truncate, terminally minutely circumciliate; seed subprismatic-subpyramidal, longitudinally striate.

Herbaceous perennials with a short subcarnose caudex; sheaths more or less equitant, conduplicate, on the ventral side extending into the zone of union with the blade as an acutely attenuate area, and conversely the blade extending along the "back" of the sheath, ventrally for ca. half the length of the sheath; the blades narrowly linear. A genus of five known species confined to low altitudes in the Upper Orinoco and Negro drainages.

Type: *Schoenocephalium martianum* Seub.

Key to the Species of *Schoenocephalium*

1. Sepals clearly exceeding the upply bracteoles by (3) 4–5 mm in length.
  2. Leaf-blades linear, plane; bladeless sheaths lacking.
    3. Leaf-blades 8 mm or less broad; sheaths submembranous; interior bracteoles 6–7 mm long, nerveless; anthers 2.75–3.0 mm long; plants of the Río Caquetá, Amazonas, Colombia. 1. *S. martianum.*
    3. Leaf-blades 14–16 mm broad; sheaths subcoriaceous; interior bractlets 9–10 mm long, obviously 7-nerved; anthers 4.5–5.0 mm long; plants of the Río Atabapo, Amazonas, Venezuela. 2. *S. coriaceum.*
  2. Leaf-blades terete; bladeless sheaths present; plants of the Río Guainía and Río Pacimoni, Amazonas, Venezuela. 3. *S. teretifolium.*
1. Sepals exceeding the upper bracteoles 2 (3) mm or less in length.
  4. Upper bracteoles cucullate, essentially equaling the sepals; leaves 3–5 dm long, 2.0–3.5 cm broad, the midrib inconspicuous; anthers ca. 3 mm long; ovules 2 per locule; plants of the Upper Río Orinoco and Río Siapa, Amazonas, Venezuela. 4. *S. cucullatum.*
  4. Upper bracteoles not cucullate, 1–2 (3) mm shorter than the sepals; leaves 7–9 dm long, 1.5–2.0 cm broad, the midrib prominent; anthers ca. 5 mm long; ovules 4 per locule; plants of the Río Apaporis, Vaupés, Colombia. 5. *S. schultesii.*

---

[12] Linnaea **37**: 475. 1873.

1. **Schoenocephalium martianum** Seub. Fl. Bras. 3¹: 130. 1847. Körn. Linnaea 37: 485. 1872.

Type: crescit in ascensu montis Arara-Coara, Prov. Río Negro, *Martius s.n.*

Specimens examined: Arara-Coara, Prov. Río Negro, *Martius s.n.* (holotype M photo NY, isotype B photo NY); Sabana de la Angostura, Río Caqueta, Araracuara, Amazonas, Colombia, *Garcia-Barriga y Schultes 14140* (NY, US); *14172* (NY, US).

Distribution: Known only from the type locality, where the attractive plant is common enough to supply the markets of Bogotá[13] with cut flowers.

2. **Schoenocephalium coriaceum** Maguire, sp. nov.

Herbae terrestres perennes, caudice brevissimo erecto; foliis 3–5, 5–6 dm longis; vaginis conduplicatis subcoriaceis, marginibus membranaceis angustis, apice acuto, in ligulo lanceolato 2–4 mm longo libero producto; laminis chartaceo-coriaceis, 2–5 dm longis, (6) 10–16 mm latis, 30–40-nervatis, apice basique attenuato-acuminatis; pedunculo solitario, 5–8 dm longo, 2–3 mm diam., striato, sursum apice dilato; capitulo sphaerico 2.5–3.5 cm diam., bispatheato, bracteis spathaceis ovatis acuminatis, 1.5–2.0 cm longis, demum reflexis; spiculis 16–18 mm longis numerosis, radiatis, acutis, corallinis, ad apicem albis; bracteolis 16–18, gradatis, evidenter 7-nervatis, bracteolis interioribus late ovatis, obtusis, ca. 5 mm longis, interioribus late lanceolatis vel oblongo-lanceolatis obtusis vel subacutis 9–10 mm longis, 3.5–4.0 mm latis; sepalis liberis vel connatis ad basim per 0.5–1.0 mm, oblongo-naviculoideis; 12–15 mm longis, 5 mm latis, subacutis; petalis ad basim in tubo 1.0–1.5 mm longo connatis; laminis lanceolatis subcarnulosis non exsertis, ca. 10 mm longis, apicibus minute ciliatis; staminibus 6, filamentis ad basim in tubo connatis; antheris 3–4 (?) mm longis, minute muriculatis, 4-thecatis, minute rostratis, 4-poris vel mox biporis in poris lateralibus confluentibus; ovario 3-loculari; ovulis 2 in quoque loculo; stylo filiformi plane truncato coroniformi-ciliato, 0.5 mm longo; seminibus ignotis.

Type: inflorescence coral-red, apically white, abundant, savanna 1 km. west of Cacagual, Colombia, Río Atabapo, at 100 m alt., Nov 19, 1953, *Maguire, Wurdack & Bunting 36301* (holotype NY).

Collected only from the type locality where this attractive plant is conspicuously abundant.

3. **Schoenocephalium teretifolium** Maguire, sp. nov. Figure 6.

Herbae terrestres perennes; caudice brevissimo erecto, 1–2 cm longo; phyllodiis vel prophylliis 15–25 cm longis; foliis 3–5, 5–10 dm longis, vaginis 12–20 (25) cm longis plus-minusve distichis, equitantibusque, submembranaceis, marginibus scariosis, ad basim late dilatatis; laminis teretibus, 1–3 mm diam., apicibus acutis; pedunculo solitario vel paucis, 7–12 dm longo, 2–4 mm diam., capitulo sphaerico, 2.0–3.0 cm diam.; bracteis involucralibus 2, lanceolato-triangularibus acutis, 8–12 mm longis, connatis, demum reflexis; spiculis numerosis radiatis acutis albidis vel roseis vel corallinis vel rubri-purpureis; bracteolis 16–18 gradatis, membranaceis, (1) 3–5 (7)-nervatis, plus-minusve concavis, exterioribus late ovatis, 1–3-nervatis, obtusis-apiculatis, 2.5–5.0 mm longis, interioribus ferme 5–7-nervatis, lanceolato-oblongis subacutis, 5–8 mm longis; sepalis 3, liberis, lanceolatis acutis induratis, 12–16 mm longis; petalis 8–10 mm longis, ad basim in tubo 2–4 mm longo connatis, laminis pallidis, ca. 6 mm longis, 2.5 mm latis, oblongo-lanceolatis obtusis non exsertis, apicibus minute ciliatis, nervis ca. 7; staminibus 6 ad basim in tubo 2–4 mm longo connatis; filamentis latis hyalinis, 0.5–1.0 mm longis; antheris 3–4 mm longis, oblongo-linearibus ad basim ipsam 4-thecatis, sursum 2-thecatis, ad apicem truncatis biporis; ovario late obovate ca. 1.5 mm longo, 3-loculari; ovulis 2 per loculo; stylo 6–7 mm longo, filiformi plane truncato coroniformi-ciliato, 0.5 mm longo; seminibus ignotis.

---

[13] See Schultes, R. E., Bot. Mus. Leafl. Harvard Univ. 16: 190–192. 1954.

Type: herbaceous perennials, terete leaves, heads spherical, spikelets radiate, acute, sepals basally orange, centrally white, pink-tipped, at maturity wholly bright red becoming purplish, petals included, abundant and dominant in open wet areas, Sabana Venado, Caño Pimichín, at 130–140 m alt., Río Guainía, Terr. Amazonas, Venezuela, April 14, 1953, *Maguire & Wurdack 35600* (holotype NY).

Paratypes: Sabana Venado, April 14, 1953, *Maguire & Wurdack 35633;* Nov 23, 1953, *Maguire, Wurdack & Bunting 36369;* sepals basally pink, apically white, abundant in open wet areas, Sabana Grande, Río Pacimoni, at 120 m alt., Terr. Amazonas, Venezuela, Nov 29, 1953, *Maguire, Wurdack & Bunting 36468;* Nov 27, 1953, *Maguire, Wurdack & Bunting 36639;* spikelets basally coral, apically white, maturing red, abundant, Sabana Grande, right bank Río Pacimoni, ca. 50 km above mouth at 120 m alt., Feb 7, 1954, *Maguire, Wurdack & Bunting 37569.*

4. **Schoenocephalium cucullatum** Maguire, sp. nov. Figure 6.

Herbae terrestres perennes, caudice brevissimo erecto, 1–5 cm longo, foliis non compressis; foliis 4–5 (6), 30–50 cm longis; vaginis 10–14 cm longis, plus-minusve distichis equitantibusque, subinduratis, marginibus anguste scariosis, ad basim late dilatis; laminis linearibus 20–35 cm longis, apicibus plus-minusve abrupte falcato-acuminatis, nervis a ca. 0.25 mm separatis; pedunculo 1 vel aliquantum 2, 5–8 (10) dm longo, ca. 3 mm diam., valde nervatis ad apicem compresso-dilato, 6–8 mm lato; capitulo sphaerico, 2.5–3.5 cm diam.; bracteis involucralibus 2, late lanceolato-acuminatis, 8–12 mm latis, 12–16 mm longis, demum deflexis; spiculis 40–50, radiatis obtusis albidis vel roseis vel corallinis vel rubriflavis, ca. 18 mm longis, sessilibus; bracteolis 16–18, gradatis, exterioribus 3–7 mm longis, 2–3 mm latis, ovato-oblongis vel oblongis late obtusis (1) 3–5-nervatis, interioribus 8–14 mm longis, 3.0–3.5 mm latis, 5-nervatis, obtusis valde cucullatis; sepalis 3, liberis, lanceolatis acutis, 16–18 mm longis ad basim membranaceis, sursum induratis; petalis 3, ad basim in tubo 2–4 mm longo connatis; laminis inclusis, lanceolatis obtusis, 8–10 mm longis; staminibus 6, inclusis; filamentis ad basim in tubo bulboso 2 mm longo connatis, partibus liberis ca. 2 mm longis; antheris 4-thecatis, ca. 3 mm longis, exigue furfuraceis, minute 4-annulo-poris; ovario late obovato, 3-loculari, ovulis 2 per loculo; stylis teretibus, truncatis, 9–10 mm longis, ad apicem circumciliatis, ciliis ca. 0.3 mm longis; capsulis induratis ca. 4 mm longis, oblongo-ovatis; seminibus ca. 2 mm longis, maturis, 1 in quoque loculo, compresso-subquadriprismaticis, bitruncatis valde in longitudine striatis, testa scariosa alveolata exfoliata.

Type: perennial herb to 1 m high, caudex somewhat rounded with marcescent leaf sheaths, peduncles usually 1, bracts paired, bracteoles yellowish, orange or reddish at base, white apically, sepals pale yellow or coralline, abundant in open marshy Yapacana Savanna III, 140 m alt., Cerro Yapacana, Amazonas, Venezuela, Dec 31, 1950, *Maguire, Cowan & Wurdack 30486* (holotype NY).

Paratypes: Terr. Amazonas, Venezuela: perennial to 1 m high, bracteoles yellow, orange-red at base or wholly pink, sepals yellow, abundant, Yapacana Savanna III, March 17, 1953, *Maguire & Wurdack 34529;* Nov 20, 1953, *Maguire, Wurdack & Bunting 36583;* perennial herb les than 1 m high, bracteoles basally coral, apically white, frequent marshy areas, Sabana Hechimoni, Caño Hechimoni, Río Siapa, Amazonas, Venezuela, 120 m alt., Feb 9, 1954, *Maguire,* *Wurdack & Bunting 37631;* Sabana de Mayo on south bank of Río Ventuari, 15 km above mouth, at 150 m alt., May 5, 1954, *J. Silverio Level 39;* San Antonio, Upper Orinoco, Feb 1–20, 1931, *Holt & Blake 698* (US).

5. Schoenocephalium schultesii Maguire, sp. nov.

Herbae terrestres perennes 10–14 dm altae, caudice brevissimo erecto vaginis aliquantum compressis; foliis 3–4, 7–9 dm longis; vaginis 15–20 cm longis, 1.8–2.4 cm latis conduplicatis, compressis distichis equitantibusque, subinduratis, marginibus conspicue scariosis, ad basim dilatis; laminis linearibus, 50–70 cm longis, 15–20 mm latis, nervis a ca. 0.5 mm separatis, apicibus tenuis acutis aliquantum falcatis; pedunculo solitario val aliquantum 2, 12–16 dm longo, improminenter nervato, unicapitatis ad apicem aliquantum compresso, dilatato, ca. 1 cm lato; capitulo sphaerico, ca. 4.5 cm diam.; bracteis involucralibus 2, lanceolatis, ca. 2 cm longis, demum deflexis; spiculis 60–80, radiatis acutis, 18–20 mm longis, sessilibus; bracteolis 13–15, gradatis, 4–16 mm longis, obtusis, debile 3–5-nervatis, aliquantum concavis, inferioribus ovatis vel oblongo-ovatis, superioribus oblongo-lanceolatis; sepalis lanceolatis, 17–19 mm longis, ca. 6 mm latis, acutis, naviculoideis, subinduratis; petalis lanceolatis ca. 12 mm longis sagittato-lonceolatis, 4–5 mm latis, minute maculatis, ad basim in tubo brevi connatis; staminibus 6, inclusis; filamentis ad basim in tubo brevi connatis, partibus liberis 1–2 mm longis; antheris ca. 5 mm longis, 4-thecatis, minute furfuraceo-papillatis, ad apicem 4-poris; ovario 3-loculari; ovulis 4 in quoque loculo; stylis teretibus, 9–10 mm longis, ad apicem brevissimis circumciliatis; seminibus subprismaticis, ca. 1.5–2.0 mm longis, striatis, rubellis.

Type: herb 1 m or more tall, bracteoles red, sepals white, Cerro Isibukurí, Río Kananarí (affluent Río Apaporis), Vaupés, Colombia, Oct 29, 1951, *Schultes & Cabrera 14506* (holotype NY).

Paratypes: Cerro Isibukurí, Río Kananarí (affluent Río Apaporis), Vaupés, Colombia, Oct 29, 1951, *Schultes & Cabrera 14501;* same locality, Jan 23–25, 1952, *Schultes & Cabrera 15076* (US).

Rapateoideae, Rapateeae

9. Rapatea Aublet, Hist. Pl. Gui. Franç. **1:** 305. *pl. 118.* 1775.

A genus of perhaps 20 species of wide distribution, chiefly at low elevations, in tropical South America. Taxonomic consideration of *Rapatea* is to be given in a forthcoming issue of the MEMOIRS.

10. Cephalostemon Rob. Schomburgk, *Rapatea* Frid. Aug. Saxo-Frid. Reg. 9. 1845.

Bracts linear-lanceolate, conspicuous; bractlets setiform; petals yellow, obcordate-obovate, retusely apiculate; anthers 4-celled, the posterior lobes dehiscing by a longitudinal subterminal introrse slit extending to the apex of the anterior lobes; capsule globose, trilocular, the locules uniovulate; seed elliptic-oblong, non-striate, subsessile and subbassally attached, the summit shallowly concave and centrally apiculate, surmounted by a dense white mitriform papillate mass.

Type: *Cephalostemon gracilis* (Poepp. et Endl.) Rob. Schomb.

Key to the Species of *Cephalostemon*

1. Outer bractlets setose.
  2. Setae clavate.
    3. Outer bractlets weakly nerved, non-glaucous, non-punctate; plants of marshy savannas, Amazonas, Venezuela, and Suriname. 2. *C. affinis.*

3. Outer bractlets rather strongly nerved, glaucous, strongly glandular-punctate; plants of marshy campos, southern Matto Grosso. 3. *C. angustatus.*
  2. Setae not clavate; spikelets usually 15–25; involucral bracts (3) 4–6 cm long; outer bractlet of the spikelet ca. 8.5 mm long; leaves usually 30–45 cm long, 4–6 mm broad; campos of southern Minas Gerais. 1. *C. riedelianus.*
1. Outer bractlets mucronate.
  4. Inner bractlets setose, spikelets 8–12; bracts (2.5) 3–5 cm long; leaves 30–50 cm long, 3–12 mm broad; confined to Pará. 4. *C. gracilis.*
  4. Inner bractlets mucronate; spikelets 2–3; bracts 2 cm or less long; leaves 4 mm or less broad, 15–30 cm long; confined to the campos of southern Matto Grosso. 5. *C. microglochin.*

1. **Cephalostemon riedelianus** Körnicke, Linnaea **37:** 445. *pl. 1, f. 1–12.* 1873.

Rapatea gracilis Seubert, Fl. Bras. 3^1: 129, spec. *Sello*, 1847; not Poepp. & Endl. Nov. Gen. & Sp. **2:** 51. 1838.

Type: in pratis humidis Serra da Lapa, Prov. Minas Gerais, Brazil, *Sello s.n.* (holotype B).

Distribution: Campos of southern Minas Gerais and possibly adjacent Goyaz, Brazil.

2. **Cephalostemon affinis** Körnicke, Linnaea **37:** 447. 1873.

Type: prope Esmeralda ad flumen Orinoco, Dec 1853, *Spruce 3228* (holotype P; isotypes G, K, NY).

Distribution: Open marshy places, Esmeralda Savanna, in the vicinity of Cerro Duida, and Yapacana Savanna, Amazonas, Venezuela, and Tafelberg, Suriname.

3. **Cephalostemon angustatus** Malme, Ark. Bot. **$26A^9$:** 11. 1934.

Type: loco aperto uliginoso juxta cum Eriocaulaceis, Zyridis spec., etc., Serra da Chapada, Buriti, Matto Grosso, Brazil, June 25, 1894, *G. A. Malme 1710* (holotype S, isotypes B, S).

Distribution: Open marshy areas; known only from the type region, Serra da Chapada, south-central Matto Grosso.

4. **Cephalostemon gracilis** (Poepp. & Endl.) Rob. Schomburgk, *Rapatea* Frid. Aug. Saxo-Frid. Reg. 9. 1845.

Rapatea gracilis Poepp. & Endl. Nov. Gen. & Sp. **2:** 51. *pl. 168.* 1838.

Type: in paludosis camporum Campinas dictorum ad Colares, versus ostia fluv. Pará [Brazil], Junio flor. *Poeppig 2986* (holotype B, isotype G).

Distribution: Paludose plants of open sandy places; known only from low altitudes in the State of Pará, Brazil.

5. **Cephalostemon microglochin** Sandwith, Kew Bull. **1929:** 125. 1929.

Type: flowers pale yellow, in moist boggy soil on edge of fringing forest, near source of Rio Paraguay (Rio Amolar), Diamantino, Matto Grosso, Brazil, May 23, 1927, *Dorrien Smith 151* (holotype K).

Distribution: Palustrine plants of the campos, southern Matto Grosso, Brazil.

11. **Duckea** Maguire, gen. nov.

Inflorescentia subglobosa, multispicata, bibracteata; spicis lanceolato-fusiformibus, unifloris; bracteolis gradatis imbricatis; flore trimero; sepalis lanceolatis, ad basim connatis; petalis inclusis ad basim connatis; staminibus 6, antheris 4-thecatis, poro oblique apicali uno dehiscentibus; ovario 3-loculari, loculo uniovulato, ovulo subsessili exappendiculato prope basim affixio; séminibus elliptico-oblongis, conspicue striatis, rapha ventrali plus-minusve conspicua.

Herbae perennes basibus fibrosis, foliis subequitantibus.

Typus: *Duckea cyperaceoidea* (Ducke) Maguire.

Key to the Species of *Duckea*

1. Bracteoles of the spikelets acuminate; inflorescence globose; leaves gramineous.
  2. Inflorescence less than 2 cm in diameter; bracteoles ascending at maturity, inconspicuously nerved, the apex strongly aristate; petals much shorter than the sepals. 1. *D. cyperaceoidea.*
  2. Inflorescence exceeding 2 cm in diameter; bracteoles squarrose at maturity, strongly 5–7-nerved, the apex merely acuminate; petals more or less equaling the sepals. 2. *D. squarrosa.*
1. Bracteoles obtuse or acute.
  3. Inflorescence globose, 1.0–1.4 cm long; bracteoles acute; leaf-blades terete, somewhat compressed upwards. 3. *D. junciformis.*
  3. Inflorescence oblong, 2–4 cm long; bracteoles obtuse; leaf-blades plane, subsucculent. 4. *D. flava.*

1. **Duckea cyperaceoidea** (Ducke) Maguire, comb. nov.

Cephalostemon cyperaceoides Ducke, Arch. Bot. Jard. Rio de Janeiro 1: 10. 1915.

Type: campos do orientum appiduli. Fero, Pará, Brazil, May 23, 1911, *A. Ducke 11702.*

Distribution: Wet sandy soil of savanna and campos, tributaries of the Ríos Guainía and Casiquiare, Venezuela, Rio Negro, Amazonas, Brazil, and the lower basins of the Rios Jamundá, Trombetas, and Tapajóz, Pará, Brazil.

Specimens examined: BRAZIL: Pará: Campos do Fero, *Ducke 11347* (holotype US photo NY, isotype RB, F, MG); Campos do Ariramba, fl. Trombetas, Dec 4, 1910, *Ducke 11343*, immature (paratypes US photo NY, photo F, S); same locality, Nov 30, 1913, *Ducke 14885* (paratype US, photo F); Campina Bello Vista, Rio Tapajóz, Dec 6, 1915, *Ducke 15832* (US photo NY, photo F); Campina de Perdicto, Rio Tapajóz, Sept 24, 1922, *Ducke 18786* (B, S). Amazonas: Caatinga, Itaubal, Rio Aracá, Rio Negro, Oct 26, 1952, *Froes & Addison 29131* (NY). VENEZUELA: Terr. Amazonas: Flowers yellow, infrequent, savanna margin, Sabana El Venado, Caño Pimichín at 140 m alt., April 14, 1953, *Maguire & Wurdack 35572;* occasional, savanna edge, Sabana Venado, 140 m alt., Nov 23, 1953, *Maguire, Wurdack & Bunting 36363;* common in open marshy savanna, Sabana Grande, right bank Río Pacimoni 50 km above mouth, at 110 m alt., Nov 29, 1953, *Maguire, Wurdack & Bunting 36467;* Feb 7, 1954, *Maguire, Wurdack & Bunting 37573; 37686;* flowers yellow, frequent, Sabana Hechimoni, Caño Hechimoni, at 120 m alt., Feb 9, 1954, *Maguire, Wurdack & Bunting 37630.*

Duckea cyperaceoidea is most closely related to *D. squarrosa*, an affinity already noted by Ducke.

2. **Duckea squarrosa** (Willd. ex Link) Maguire, comb. nov.

Dichromena squarrosa Willd. Herb. Willd. No. 1153.
Dichromena squarrosa Link, Jahrb. 3: 77. 1820.
Rapatea? squarrosa (Link) Kunth, Enum. Pl. 3: 367. 1841.
Cephalostemon squarrosus Körnicke, Linnaea 37: 450. 1874.

Type: ad fluv. Orinoco, *Humboldt s.n.* (B, Herb. Willd. *1153*).

Distribution: Inundable or swampy land, Edo. Bolívar and the Upper Orinoco River, Venezuela, and the Rio Icana, affl. Rio Negro, Amazonas, Brazil.

Specimens examined: VENEZUELA: Edo. Bolívar: swampy ground, large savanna, vic. Urimán, alt. 300 m, April 30, 1953, *Steyermark 75323.* Terr. Amazonas: ad fluv. Orinoco, *Humboldt s.n.* (holotype Herb. Willd. 1153, B, photos F, NY, US); spikelet of the type and drawings, Herb. Nees (B); sabanitas margen del Río Temí, Yavita, Jan 30, 1942, *Williams 14085* (F, US); locally occasional, reclining sedge-like herb, floodbanks under palm thicket, Río Temí, at 130 m alt., Oct 18, 1950, *Maguire 29376;* Yapacana Savanna No. 1, at 120 m alt., Jan 7, 1951, *Maguire, Cowan & Wurdack 30799;* bractlets white, squarrose, flowers bright yellow, Yapa-

cana Savanna No. 1, at 120 m alt., March 17, 1953, *Maguire & Wurdack 34511;* frequent, edge of Yapacana Savanna III, March 17, 1953, *Maguire & Wurdack 34536;* Yapacana Savanna II, at 125 m alt., Nov 20, 1953, *Maguire, Wurdack & Bunting 36625B.* Brazil. Uacaña, Rio Icana, Amazonas, April 4, 1952, *Froes 28182* (NY).

3. **Duckea junciformis** Maguire, sp. nov. Figure 7.

Herbae perennes valde glaucae, caudice simplici brevi; foliis paucis, laminis 40–60 cm longis, teretibus, sursum plano-compressis, 1.5–2.5 mm latis, minute punctatis, obtusis; vaginis 10–15 cm longis, pallidis, saepe ex laminis; scapis pluribus teretibus, saepe tumidis, 50–80 cm longis, 2–4 mm diam.; inflorescentia globosa, multispicata, 14–18 mm diam., bibracteata; bracteis lineari-lanceolatis, 2–4 cm longis, 1.5–2.0 mm latis, acutiusculis, demum reflexis; spicis lanceolato-fusiformibus, 9–11 mm longis; bracteolis 25–30, gradatis, 3–6 mm longis, ovatis vel sursum lanceolatis, acutis, exterioribus rufis, 1-nervatis, interioribus pallidis, 5–7-nervatis; sepalis 3, lanceolatis, 7–8 mm longis, ad basim scariosis, connatis, sursum aliquantum induratis; petalis 3, luteis, inclusis, ca. 5 mm longis, laminis oblongo-ovatis, apiculatis, ca. 2.5 mm longis, minute maculatis, unguibus ad basim connatis, ca. 2.5 mm longis; staminibus 6; filamentis scariosis, planis, ca. 3 mm longis, ad basim tubo corollae adnatis; antheris 4-thecatis, lanceolatis, ca. 3 mm longis, poro solitario oblique dehiscentibus; stylo subulato, stigmate apicali truncato plus minusve concavo; ovario 3-loculari, 3-ovulato, ovulis basifixis; capsula oblonga, ca. 3 mm longa, ad apicem depressa; seminibus oblongis, 2.0–2.3 mm longis, aliquantum 3-angulatis, minute apiculatis, testa hyalina in longitudine striata.

Type: perennial herb with yellow flowers, herbage glaucous, scapes becoming somewhat tumid, frequent, marshy area, sabanita 1 km east of Maroa, at 130 m alt., Río Guainía, Terr. Amazonas, Venezuela, April 16, 1953, *Maguire & Wurdack 35697* (holotype NY). Paratype: Abundant, sabanita 1 km east Maroa, type locality, Nov 25, *Maguire, Wurdack & Bunting 36417.*

Known only from the vicinity of Maroa, but there abundant.

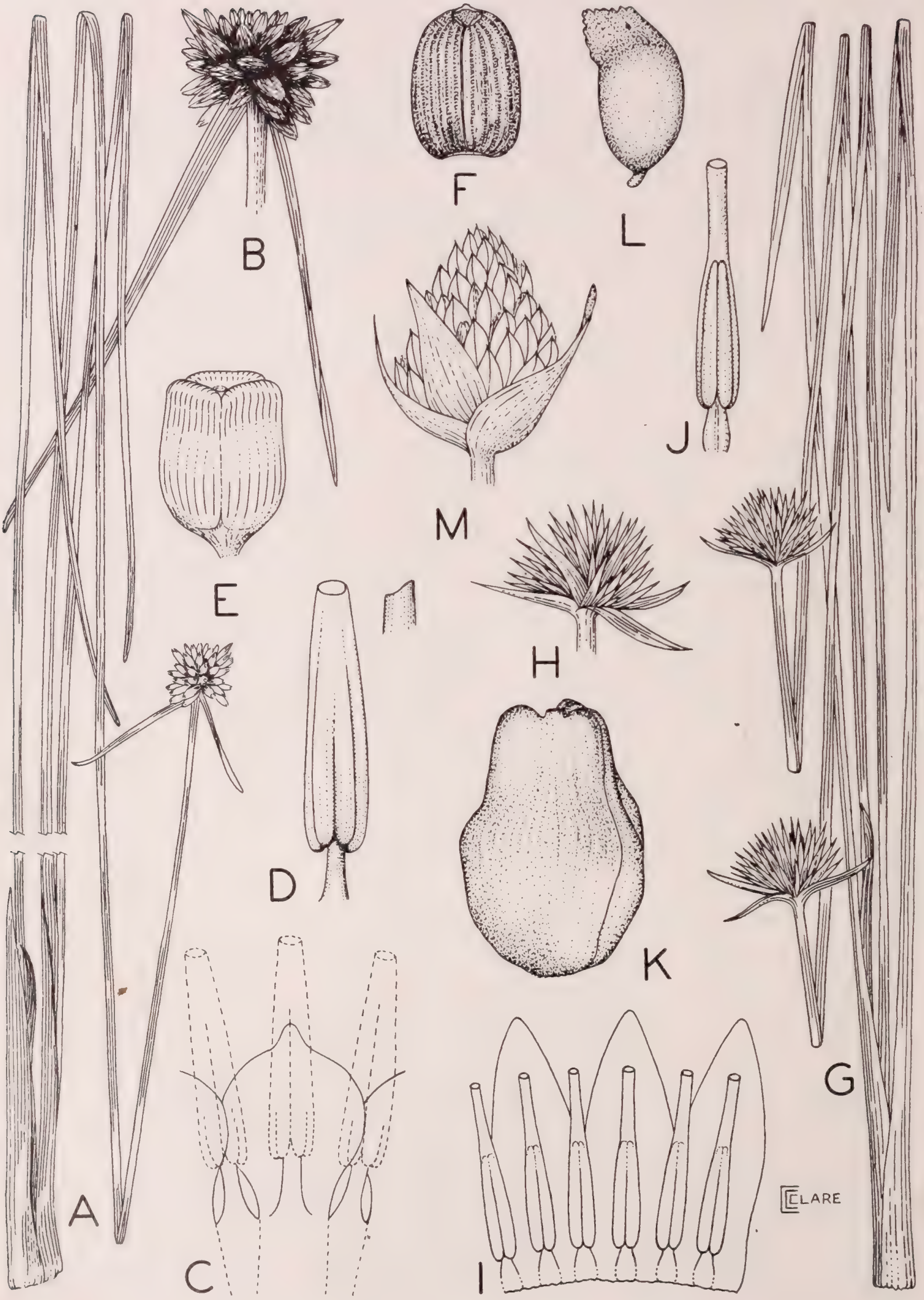
Specimens examined: VENEZUELA: Terr. Amazonas: *Maguire & Wurdack 35697* (holotype NY); Nov 25, 1953, *Maguire, Wurdack & Bunting 36417.* COLOMBIA: Vaupés. Puerto Colombia, opposite Maroa, Río Guainía, Oct 31–Nov 2, 1952, *Schultes, Baker & Cabrera 18167* (NY).

4. **Duckea flava** (Link) Maguire, comb. nov.

Schoenus flavus Link, Jahrb. **3**: 75. 1820.
Rapatea? flava (Link) Kunth, Enum. Pl. **3**: 367. 1841.
Monotrema flavum (Link) Körnicke, Linnaea **37**: 478. 1874.

Type: Maipure, Venezuela, *Humboldt 1094* (B).

Specimens examined: BRAZIL: flores pallide flavi, super cataractas ad ripas arenosis, Rio Curicurary (affl. Rio Negro), Amazonas, Nov 23, 1936, *A. Ducke 35593* (RB, P, S, G, NY, US.) VENEZUELA: Temí, Yavita, Amazonas, alt. 128 m, Jan 30, 1942, *L. Williams 14087* (F, US, VEN); Maipure, *Humboldt & Bonpland 1094* (holotype B); locally common, perennial herb 3–4 m high, in thickets of recently flooded small bamboo and palm, on white sand, Río Temí, Río Atabapo, ½ hour below Yavita, Oct 19, 1950, *Maguire 29321;* occasional, flowers yellow, at length whitish, thickets, caatinga, Savanna III at base of Cerro Yapacana, 175 m alt., Dec 31, 1951, *Maguire, Cowan & Wurdack 30487;* Yapacana Savanna I, Jan 7, 1951, *Maguire, Cowan & Wurdack 30800;* flowers yellow, thickets, lagoona, Caño Yapacana, occasional, 125 m alt., March 16, 1953, *Maguire & Wurdack 34492;* Caño Pimichín, at 125–135 m alt., April 14, 1953, *Maguire & Wurdack 35630;* clumped perennial herb near water's dege, occasional, edge of laja, 50 km above mouth of Río Pacimoni, at 120 m alt., Nov 27, 1953, *Maguire, Wurdack & Bunting 36643;* flowers yellow, frequent, savannas on right bank of Río Pacimoni, 50 km above mouth at 120 m alt., Feb 7, 1954, *Maguire, Wurdack & Bunting 37598;* flowers yellow, locally


B
F
L
M
J
E
H
D
K
G
A
C
I
CLARE

frequent, Caño Hechimoni, 8 km above mouth, Río Siapa, at 120 m alt., Feb 9, 1954, *Maguire, Wurdack & Bunting 37662.*

Duckea flava has no more in common with *Monotrema* than *D. squarrosa* and *D. cyperaceoidea* have with the tightly knit genus *Cephalostemon*. As assembled here, the genus is possibly less homogeneous than is characteristic of genera in the Rapateaceae, yet the four species are held together quite satisfactorily by similarity of anthers and seed.

12. **Spathanthus** Desvaux, Ann. Sci. Nat. **13:** 45. 1828.

Involucral bract solitary, spathaceous, lanceolate; inflorescence spicate, adnate to the spathe; spikelets sessile, numerous; bractlets numerous, distichous; petals lanceolate; anthers 4-locular, dehiscing by a single apical inequilaterally toothed pore; ovary 3-celled, subapocarpellate, two carpels abortive, the third maturing, bearing a single ovule; style centrally subbasal; capsule unilocular, bivalvate, monospermous; seed oblong-elliptic, striate, subbasally affixed.

Uliginose terrestrial herbs with distichous leaf-sheaths and linear blades; peduncles 1–several, solitary in the leaf axil.

Type: *Spathanthus unilateralis* (Rudge) Desv.

Key to the Species of *Spathanthus*

1. Leaf-blades commonly 4–7 cm broad; bracteoles acute or acuminate, short-pungent; plants of Guiana, from Venezuela to Brazil. 1. *S. unilateralis.*

1. Leaf-blades commonly 1–3 cm broad; bracteoles obtuse, more or less apiculate; plants of the Río Negro, Upper Río Orinoco drainage. 2. *S. bicolor.*

1. **Spathanthus unilateralis** (Rudge) Desv. Ann. Sci. Nat. **13:** 45. *pl. 4, f. 1.* 1828.

Key to the Varieties of *Spathanthus unilateralis*

1. Leaf-blades gradually narrowed to an acute, usually attenuate base; petioles 5–20 cm long or essentially lacking. var. *unilateralis.*

1. Leaf-blades abruptly contracted at the base; petioles manifest, 15–40 cm long.
    2. Leaf-blades cordate or subcordate at the base. var. *jenmani.*
    2. Leaf-blades inequilaterally obtusely contracted at the base. var. *abruptus.*

Spathanthus unilateralis var. **unilateralis.**

Mnasium unilaterale Rudge, Pl. Guian. **1:** 12. *pl. 11.* 1805.

Rapatea unilateralis (Rudge) Schult. & Schult. in Roem. & Schult. Syst. Veg. 7: 1149. 1830.

Type: Guiana [French Guiana], Herb. Rudge, British Museum. The plate, *pl. 4,* is a clearly drawn representation of the species.

Distribution: Terrestrial perennial herbs of low altitude, swampy rainforest; widely distributed, Venezuela to Pará and Amazonas, Brazil.

FIG. 7. A–F, *Duckea junciformis.* A, habit, × ½; B, inflorescence, × 1½; C, diagrammatic representation of corolla, × 8; D, stamen, × 10, tip of anther, × 10; E, capsule, × 7; F, ventral view of seed, × 10; drawn from *Maguire & Wurdack 35697.* G–L, *Monotrema bracteatum.* G, habit, × ½; H, inflorescence, × 1½; I, diagrammatic representation of flower, × 7½; J, stamen, × 10; K, capsule, × 10; L, seed, × 10; drawn from *Maguire, Cowan & Wurdack 30461* and *Maguire, Wurdack & Bunting 36569, 36605.* M, *Monotrema affine,* inflorescence, × 1½, drawn from *Maguire, Wurdack & Bunting 36570.*

Spathanthus unilateralis var. **jenmani** (N. E. Br.) Maguire, Brittonia **8:** 232. 1957.

Spathanthus jenmani N. E. Brown, Kew Bull. **1906:** 6. 1906.

Type: Waratuk Path, Potaro River, British Guiana, Oct 1898, *Jenman 7468* (holotype K, isotype NY).

Distribution: Wet sandy places at low altitudes; known only from the Potaro River Gorge, British Guiana, where the variant is generally but locally confined and of consistent morphological form.

Spathanthus unilateralis var. **abruptus** Maguire, Brittonia **8:** 232. 1957.

Type: herb of wet to moist places; spathe white except green apical portion, flowers yellow, locally frequent, forest behind Oyapock Airfield, Amapá, Brazil, Dec 7, 1954, *Cowan 38701* (holotype, NY).

Distribution: Swampy or areas in low altitude rain-forest, Central Guiana, the region of the Oyapock River in Amapá, Brazil, and French Guiana. This variant is a geographical analogue of var. *jenmani*.

2. **Spathanthus bicolor** A. Ducke, Arch. Inst. Biol. Veg. Rio de Janeiro **2:** 28. 1935.

Type: frequens in silvula "caatinga" humili secus ripas saxosas cataractae Cajú fluminis Curicuriary Rio Negro superioris affluentis (civitate Amazonas) 20–10–1932, leg. *A. Ducke* H. J. B. R. No. *24,177* (holotype US, isotype RB, B).

Distribution: Plants of wet places, "caatingas" or open woodlands; headwaters of the Rio Negro, Amazonas, Brazil, and the Río Orinoco, Amazonas, Venezuela.

Rapateoideae, Monotremeae

13. **Monotrema** Körnicke, Linnaea **37:** 475. 1853.

Peduncles axillary, 1–2 per leaf axil, monocephalous; inflorescence small, subglobose, 1–2-bracteate; spikelets subtended by a secondary bract; petals yellow, lanceolate; anthers basally 4-celled, the anterior cells ½–⅔ the length of the posterior cells, dehiscing by a single, circular, obliquely apical pore; ovary pyriform, 3-celled, 3-lobed, the locules uniovulate, the ovules sublaterally attached; seed oval, white, finely muriculate, basally apiculate, provided with a prominent applanate appendage at the apex.

Herbaceous perennial with narrowly linear or gramineous leaves.

Type: *Monotrema aemulans* Körn.

Terrestrial herbs of sandy and at least periodically wet savannas, confined to the drainages of the Río Negro and Upper Río Orinoco.

Key to the Species of *Monotrema*

1. Primary bracts of the inflorescence not at all or inconspicuously exceeding the head.
  2. Heads more or less depressed-hemispheric.
    3. Spikelets numerous, usually 50–75, the heads usually subdidymous. 1. *M. aemulans.*
    3. Spikelets few, 5–10, the heads not subdidymous. 2. *M. arthrophyllum.*
  2. Heads ovate or broadly conic, obviously longer than broad. 3. *M. xyridoides.*
1. Primary bracts of the inflorescence conspicuously exceeding the head.
  4. Primary bracts narrowly lanceolate, 2–3 cm long; outer bracteoles exceeding the body of the spikelet. 4. *M. bracteatum.*
  4. Primary bracts, or at least the outer, ovate or ovate-lanceolate, 1–2 cm long; bracteoles ovate or oblong-ovate, not exceeding the body of the spikelet. 5. *M. affine.*

1. **Monotrema aemulans** Körnicke, Linnaea **37:** 477. 1873.

Stegolepis aemulans (Körn.) Benth. & Hook. Gen. *Pl.* **3:** 859. 1883.

Type: ad flumen Casiquiare, Vasiva et Pacimoni, in silvarum aquosis [Amazonas, Venezuela], Jan [18]53, *R. Spruce 3292* (holotype M, isotypes BR, K, NY, photo G).

Distribution: Sandy, periodically wet open or brush savannas of the Upper Ríos Orinoco and Negro, Amazonian Venezuela, and Brazil.

2. **Monotrema arthrophyllum** (Seub.) Maguire, comb. nov.

Schoenocephalium arthrophyllum Seubert in Mart. Fl. Bras. **3^1:** 131. 1847.

Type: in petrosis grammosis umbrosis montis Arara-Coara, Río Caquetá, Colombia, Jan 1820, *Martius 3164A* (holotype M). Two specimens at Munich represent the type and isotype respectively, the first named and signed by Seubert, with an appended ticket bearing the number 1039; the second with a ticket number 1040.

Distribution: Araracuara, Río Caquetá, Colombia, known certainly only from the type locality. Probably a depauperate form of the preceding.

3. **Monotrema xyridoides** Gleason, Bull. Torrey Club **58:** 332. 1931.

Type: east swamp, Esmeralda, Amazonas, Venezuela, alt. 325 ft., Oct 19, 1928, *Tate 245* (holotype NY, isotype US).

Distribution: Wet, mostly open savannas of Upper Río Orinoco, the Ríos Ventuari, Atabapo and Guainía, Amazonia Venezuela, and adjacent Colombia.

4. **Monotrema bracteatum** Maguire, sp. nov. Figure 7.

Herbae terrestres perennes, caudice erecto, 2–4 cm alto; foliis 4–6 in quoque tempore, 25–45 cm longis; vaginis ad basim 10–15 mm latis, 6–10 cm longis, nec equitantibus nec distiche dispositis; laminis 20–35 cm longis, 3–7 mm latis gramineis glabris, 5–9-nervatis; foliis veteribus marcescentibus; pedunculis 1–5, 25–50 cm longis, ca. 1.0–1.5 mm latis, 4–5-angulatis costatisque; capitulis solitariis; bracteis primariis 2–3 cm longis, ad basim 6–8 mm latis, lanceolato-acuminatis, albidis aliquantum viridibus, 9–11-nervatis; bracteis secondariis numerosis ca. 25, supra gradatim parvioribus, quoque spiculam subtendenti, albidis; spiculis 8–10 mm longis, bracteolis ferme 5, anguste lanceolatis, acutis, 6–10 mm longis, exterioribus longioribus; sepalis 3, lanceolatis, 6–7 mm longis, 2 mm latis, acutis; petalis 3, flavidis, unguibus ca. 3 mm longis, ca. 1.5 mm latis, laminis oblongo-lanceolatis, 4–5 mm longis, 1.5–2.0 mm latis; staminibus 6; filamentis liberis, ca. 4 mm longis; antheris 3.0–3.5 mm longis, ad basim 4-thecatis, uniporis, poro oblique apicali; ovario angulari-ovato-pyriformi, apice minute 3-lobulato, 3.0–3.5 mm longo, 3-ovulato; seminibus, appendice inclusa, 2 mm longis, ovalis minute muriculatis.

Type: herbaceous perennial 30–60 cm high, outer bracts green, inner white, petals pale yellow, frequent in partially open scrub savanna, Yapacana Savanna II, at 150 m alt., Río Orinoco, Terr. Amazonas, Venezuela, Nov 20, 1953, *Maguire, Wurdack & Bunting 36624* (holotype NY).

Paratypes: Yapacana Savannas: herb to 4 dm high, multibracteate, outermost bracts white, flowers pale yellow, scrub savanna, Savanna I, Dec 31, 1950, *Maguire, Cowan & Wurdack 30461;* herbaceous perennial with white bracts and pale yellow flowers, open woodland near Savanna III, March 17, 1953, *Maguire & Wurdack 34534;* perennial herb, polybracteate, outermost green, inner white, bracteoles white, flowers pale yellow, in open *Terminalia* society, Savanna III, Dec 31, 1950, *Maguire, Cowan & Wurdack 30490;* Savanna I, March 17, 1953, *Maguire & Wurdack 34510;* frequent, sparse bush, Savanna III, Nov 20, 1953, *Maguire, Wur-*

dack & Bunting 36569; common north side Savanna III, Nov 20, 1953, *Maguire, Wurdack & Bunting 36605;* Savanna III, Nov 20, 1953, *Maguire, Wurdack & Bunting 36610.*

Monotrema bracteatum is known only from the wet Yapacana Savannas, where it occurs commonly, but is mostly confined to peripheral or scrub savanna area.

5. **Monotrema affine** Maguire, sp. nov. Figure 7.

Herbae terrestres perennes, caudice erecto vel suberecto 2–5 cm alto; foliis 5–7 in quoque tempore, 30–50 cm longis; vaginis 8–12 cm longis, ad basim 15–20 mm latis, nec equitantibus nec distiche dispositis; laminis 20–40 cm longis, 6–8 mm latis, glabris, gramineis, 9–13 nervatis; foliis veteribus marcescentibus; pedunculis axillaribus 1 vel 2 per folium, 5–7 dm longis, ca. 1 mm diam., quadrangularibus, 6-costatis; capitulis solitariis, 12–15 mm longis; bracteis primariis 1–2, ovato-lanceolatis, 15–20 mm longis, ad basim 6–10 mm latis, acutis, cum 9–13 nervis principalibus; bracteis secondariis numerosis ca. 20–30 ferme spiculas subtendentibus, bracteis oblongo-lanceolatis, 10–13 mm longis, 3–5 mm latis, marginibus scariosis, apicibus obtusis, minute aristatulis; spiculis 15–25, stipitatis, stipitibus ca. 1 mm longis; bracteolis 5–7, 6–7 mm longis, aliquantum acutis; petalis flavidis, 6–7 mm longis, unguibus ca. 2 mm longis, laminis lanceolatis acutis, 4–5 mm longis; staminibus 6, antheris ca. 4 mm longis, ad basim 4-thecatis, uniporis, poris oblique terminalibus; ovario evidenter non maturo.

Type: herbaceous perennial 5–7 dm high, bracteoles white, petals pale yellow, frequent in sparse savanna bush, north edge of Savanna III, 125 m alt., Río Orinoco, Terr. Amazonas, Venezuela, Nov 20, 1953, *Maguire, Wurdack & Bunting 36611* (holotype NY).

Paratypes: Yapacana Savannas: herbaceous perennial forming hummocks in caatinga, Savanna III, Dec 31, 1950, *Maguire, Cowan & Wurdack 30488;* frequent, edge Savanna III, March 17, 1953, *Maguire & Wurdack 34535;* perennial herb with yellow flowers, Savanna III, March 17, 1953, *Maguire & Wurdack 34566;* perennial herb 50–70 cm high, outer bracts greenish, inner white, bearing straw-colored pale yellow flowers, occurring where *Monotrema bracteatum* & *M. xyridoides* grow together, occasional in Savanna III, Nov 20, 1953, *Maguire, Wurdack & Bunting 36570;* infrequent in open woodland near Savanna I, Nov 20, 1953, *Maguire, Wurdack & Bunting 36607.*

There is suggestive evidence that *Monotrema affine* is a sterile hybrid between *M. bracteatum* and *M. xyridoides.* In stature *M. affine* is usually somewhat larger than either of the others. In floral characters it seems to be somewhat intermediate between them, but the bracteoles are scarious-margined, a character that does not obtain in either of the other two. In material examined, no mature ovary or seed was found, although pollen seemed normal. And finally, this possible hybrid occurs only in the presence of the two suspected parents, so is thus confined, so far as known, to the Yapacana Savannas, to which *M. bracteatum* also is limited. *M. xyridoides* is of more extended distribution, but in its additional range occurs without the presence of either *M. bracteatum* or *M. affine.*

14. **Potarophytum** Sandwith, Kew Bull. **1939:** 20. 1939.
Parophytum riparium Sandwith, Kew Bull. **1939:** 21. 1939.

Type: Kaiteur Falls, in deep shade by a stream in the forest, Potaro River, British Guiana, at 400 m alt., Sept 5, 1937, *Sandwith 1382* (holotype K).

In addition to the type collection is the following: locally frequent in boggy place along stream near Potaro River Landing, Kaieteur Plateau, May 11, 1944, *Maguire & Fanshawe 23396.*

A monotypic genus, known only from the Kaieteur Plateau near the head of the falls.

15. **Windsorina** Gleason, Bull. Torrey Club **50:** 148. 1923.
Windsorina guianensis Gleason, Bull. Torrey Club **50:** 148. 1923.

Type: dense upland bush, Kangaruma-Potaro Landing, Potaro River, British Guiana, June 1921, *Gleason 272* (holotype NY).

Besides the type, three other collections have been made, viz.: Amatuk Portage, *Sandwith 1516;* and Potaro Road, 106.5 mile, *Maguire 32143;* mile 107, *Maguire 32142.*

A monotypic genus represented by *W. guianensis* Gleason, apparently confined to river level in the lower part of the Kaieteur Gorge.

16. **Maschalocephalus** Gilg & Schumann, Engl. Jahrb. **28:** 148. 1900.
Maschalocephalus dinklagei Gilg & Schumann, Bot. Jahrb. **28:** 148. 1900.

Type: Fishtown, Gran Bassa, Liberia, Oct 16, 1898, *M. Dinklage 2088* (holotype B, isotypes G, K).

A monotypic genus widely distributed in marshy savanna areas in African Liberia. According to Baldwin[14] one collection is known from Sierra Leone, and the species is expected to be found on the Ivory Coast. The African *Maschalocephalus* is the only extra-American member of the Rapateaceae known. The family otherwise is exclusively tropical American (see footnote, p. 21).

GUTTIFERAE

Clusia L. sect. **Clusiastrum** Pl. & Tr. Ann. Sci. Nat. ser. IV. Bot. **13:** 322. 1860; emend Maguire.

In his botanical report on the remarkable Guiana findings of the Schomburgk brothers, Bentham (l.c.) described *Clusia cuneata,* which with *C. crassifolia* Pl. & Tr. became the basis for Planchon and Triana's Section *Clusiastrum.* In the *Flora brasiliensis,* Engler[15] adapted *Clusiastrum* as a subsection of sect. *Criuva,* including within it *Clusia fragrans* Gardn. and *C. sessilis* (Klotzsch) Engl. A few years later Vesque[16] associated a fifth species, *C. schomburgkii* Vesque, with the above four in *Clusiastrum* as a subsection of *Criuva.* And, finally, Engler[17] reinstated sect. *Clusiastrum,* including within it the five species recorded above and *Clusia plukenetii* Urb. from islands of the Lesser Antilles, making in all six species that had so far been accredited to the assemblage. I subscribe to the later judgment of Engler, but would exclude certain species recognized by him.

As a result of our recent field activities in Guayana, two additional species of the group, *C. stylosa* Maguire and *C. tabulamontana* Maguire, have already been described.[18] And now four further species are proposed herein.

Clusiastrum, as recognized by both Vesque and Engler, does not represent a natural community of species. Accordingly, the following realignment within the sect. *Clusiastrum* is presented as a part of my continuing studies in the Guttiferae.

---

[14] Am. Jour. Bot. **37:** 402–405. 1950.
[15] Mart. Fl. Bras. **12:**^{1} 401. 1888.
[16] DC. Monogr. **8:** 32–33. 1893.
[17] Nat. Pflanzenf. ed. 2. **21:** 200. 1925.
[18] Bull. Torrey Club **75:** 419–420. 1948.

Classification of the species of *Clusia* has been historically, and is for the most part herein, based predominantly on the highly diversified androecium of the staminate flower. Of equal fundamental significance is the morphology of the gynoecium, which often, as indeed is true with the members of the *Clusiastrum*, may more readily indicate close interrelationship than the character and arrangement of the stamens. Numbers and arrangement of perianth parts often are of more value for diagnosis of subgeneric taxa than has generally been accorded.

The following review strives to employ the consideration of basic morphological organization of flowers of both sexes, and of course concommitant foliar and latex-color character.

Sepals 6–14, the upper imbricate; petals 6–8; stamens numerous, the filaments slender, free, the anthers muticous, more or less equaling the filaments, the connective narrow, the thecae clavate or subclavate, dehiscing laterally by a pseudopore immediately below the apex, which sometimes extends nearly halfway the length of the anther; rudimentary pistil lacking in the staminate flower; staminodia of the pistillate flower numerous, free, linear, anantherous; ovary 10–16-locular, multiovulate, the ovules biseriate; styles equaling the locules in number, free, terete, slender, radiate; stigmas distally and ventrally affixed; leaves coriaceous, sessile or subsessile by virtue of a winged petiole; small or large trees, not epiphytic; latex white.

Confined to the Guayana Highland of southern Venezuela, adjacent Brazil and British Guiana, and coastal Guiana.

Key to the Species of *Clusia* sect. *Clusiastrum*

1. Styles filiform, essentially free to the base, exceeding 1 mm in length, radiate or recurved; fruit oblong to globose, considerably more than 1 cm thick; anthers linear-clavate, commonly exceeding 1 mm in length, dehiscing by subapical lateral pores. Subsect. *Crassifolia.*
  2. Leaves obtuse.
    3. Inflorescence 1–3-flowered, the pistillate usually 1-flowered, the staminate commonly 3-flowered, when 3-flowered not compact.
      4. Flower buds (both sexes) massive, 2–3 cm in diameter; petals 5–6 cm long.
        5. Petals broadly obovate; leaves broadly obovate, 8–18 cm long, 6–10 cm broad, thickly coriaceous. 1. *C. crassifolia.*
        5. Petals oblanceolate; leaves elliptic or elliptic-oblanceolate, 6–14 cm long, 3–5 cm broad, thinly coriaceous. 2. *C. phelpsiana.*
      4. Flower buds 1.0–1.5 (2.0) cm in diameter.
        6. Leaves commonly exceeding 12 cm in length.
          7. Leaves elliptic, 10–16 cm long, 5–7 cm broad; styles 16. 3. *C. tabulamontana.*
          7. Leaves oblanceolate ca. 30 cm long, 6–7 cm broad; styles 10–12. 4. *C. steyermarkii.*
        6. Leaves commonly 10 cm or less long.
          8. Sepals 6–7, concave, orbicular, obovate, broadly scarious-margined; ovary not sulcate; leaves oblanceolate, ovate-cuneate, or cuneate. 5. *C. pusilla.*
          8. Sepals 9–10, ovate, acutish, somewhat keeled, cucullate; ovary strongly 10-sulcate; leaves oblanceolate. 6. *C. amabilis.*
    3. Inflorescence (3) 5–15-flowered, compact.
      9. Stylar beaks lacking; styles ca. 20, 3 mm long; leaves 10–20 cm long, 5–9 cm broad, oblanceolate. 7. *C. schomburgkii.*
      9. Stylar beak 2–4 mm long; styles 16, 3–5 mm long; leaves 20 40 cm long; 10–15 cm broad, oblanceolate to obovate. 8. *C. stylosa.*
  2. Leaves elliptic, acute at both ends, their maximum size 5 cm long, 1.5 cm broad; flowers diminutive; inflorescence 1-flowered. 9. *C. parvifolia.*

1. Styles coalesced into a disc, only the tips free; stigmas distally recurved; fruit linear-oblong, ca. 3 cm long, 8–12 mm in diameter; anthers ca. 1 mm long, clavate, the thecae laterally dehiscing distally for about half their length; leaves oblanceolate, usually less than 15 cm long; pistillate inflorescence 3–5-flowered; staminate inflorescence 7–18-flowered. Subsect. *Clusiastrum.* 10. *C. cuneata.*

1. **Clusia crassifolia** Pl. & Tr. Ann. Sci. Nat. ser. IV. Bot. **13:** 351. 1860.

Small tree to 10 m high with scanty or moderately copious whitish latex; branchlets stout, subterete, subsucculent, considerably wrinkling when dry, the internodes 1.5–4.0 cm long; petioles 12–20 mm long, broadly winged; blades thickly coriaceous, broadly obvate, 10–15 (18) cm long, (6) 7–9 cm wide, the apex rounded to subtruncate, the base cuneate, the midrib very prominent, extending to the apex, the lateral veins prominulous, 4–5 mm apart, ascending at a 45–50° angle and collected in a marginal nerve 2–3 mm from the hyaline revolute margin; inflorescence terminal, compact, 3–12-flowered, the peduncle coarse, 2–3 cm long, the bracts 8–14 mm long, oblong or obovate-oblong, keeled, obtuse, scarious-margined; sepals 7, the lowermost pair decussate, the upper 5 imbricate, orbicular-obovate, 10–12 mm long, conspicuously white-scarious-marginate; petals normally 8, cuneate-obovate, 2.5–3.0 cm long, 2.0–2.5 cm broad, white; stamens of the staminate flower numerous, the marginal stamens subsessile, 12–15-seriate, borne on a cupulate disc ca. 2 mm high, the interior stamens over the entire summit of the receptacle, the filaments subulate 3–5 mm long, almost twice the thickness of the 2–4-mm-long anthers, the anthers 4-celled, laterally dehiscing by subterminal pores that extend to the middle of the anther; staminodia of the pistillate flower numtrous, ca. 5 mm long, anantherous, 2–3-seriate, affixed on a cupulate disc ca. 1 mm high; ovary 16–20-locular, the locules multiovulate, the ovules horizontally spreading, biseriate; styles 16 or the same number as the locules, filiform, 5–6 mm long; stigmas apical, ovate-capitate, ca. 1 mm long.

Type: ''Roraima,'' *Schomburgk 709.*

Specimens examined: BRITISH GUIANA: Kaieteur Savannas: *Jenman 1259* (K); *Maguire & Fanshawe 23060* ♀; *23060* ♂; *23061* ♀; summit of east-facing escarpment, Mt. Ebini, Mahdia River, Potaro River, 700 m alt., *Maguire 32125* ♀. VENEZUELA: Edo. Bolívar: ''Roraima'' *Schomburgk 709* (holotype P, isotypes G, K). Auyán-tepuí: at 2200 m alt., *Tate 1337* (NY); 2300 m alt., *Vareschi & Foldats 4888* (VEN, NY); 1900 m alt., *Foldats 2621* (VEN, NY). Ptarí-tepuí: at 1810 m alt., *Steyermark 59508* (F, NY); southwest slope forest at 1500–2000 m alt., *Maguire & Wurdack 33872* ♂ (NY), *33908* ♂ (NY), *33909* ♀ (NY). Sororopan-tepuí at 1800 m alt., *Maguire & Wurdack 33933* ♂. Ilu-tepuí: 1300–1400 m alt., *Maguire 33221* ♀ (NY), *33220* ♂ (NY), at 2000 m alt., *Maguire 33368* ♂; at 1600 m alt., *Maguire 33285* ♂ (NY). Chimantá-tepuí: Churi-tepuí at 2050 m alt., *Wurdack 34252* ♀ (NY); Sarvén-tepuí at 1500 m alt., *Wurdack 34090* ♂ (NY); Abácapa-tepuí, at 2000–2125 m alt., *Steyermark 75004* ♀ (F, NY), *75009* ♀ (F, NY); Chimantá Massif at 1925 m alt., *Steyermark & Wurdack 376* ♀ (F, NY), *372* ♂ (F, NY).

2. **Clusia phelpsiana** Maguire, sp. nov. Figure 8.

Arbor parva, 10–15 m alta; ramis subsucculentis teretibus, 6–8 mm diam., internodiis 8–15 mm longis, latice copioso albido; foliis ellipticis vel elliptico-oblanceolatis, sessilibus vel petiolo conspicue alato 4–6 mm longo, amplectanti; laminis 8–13 cm longis, 3.5–5.0 cm latis, coriaceis, costa prominenti, nervis lateralibus prominulis, in nervo collectivo a margine 1.0–1.5 mm remoto; inflorescentia masculina terminali uniflora vel aliquando triflora; pedunculo 3–5 cm longo;

sepalis ca. 15, inferioribus jugatis, ovatis, 16–18 mm longis, superioribus subjugatis vel imbricatis suborbicularibus concavis, 18–22 mm longis, valde scarioso-marginatis; petalis 8, obovatis subunguiculatis, 4.0–4.5 cm longis, 3.0–3.5 cm latis, albis; staminibus in disco lato dispositis introrsis, exterioribus ca. 5 mm longis, interioribus 8–10 mm longis, intimis saepe sterilibus; antheris subclavatis 4-thecatis, poro subapicali laterali dehiscentibus; pistillodiis minutis filamentis nonnullis; inflorescentia foeminea uniflora; staminodiis planis, 5–7 mm longis, 5-seriatis, in annulo 2 mm alto dispositis; ovario 12–14-loculari; fructu ovato-globoso, ca. 3 mm longo, 3 cm lato; stylis liberis subfiliformibus, ca. 8 mm longis, stigmatibus distalibus ventralibus obovatis, ca. 1.6 mm longis.

Type: tree 15 m high, 30 cm diam., with scanty cream-colored latex; petals 8, white, fragile; styles 12–14, conspicuously elongate; sepals 12–15 imbricate, investing fruit at maturity; frequent along streamside in mixed montane forest below Camp No. I at 1500 m alt., Ilu-tepuí, Edo. Bolívar, Venezuela, March 10, 1952, *Maguire 33332* ♀ (holotype NY).

Paratypes: tree 15 m high with scanty whitish thick latex; flowers conspicuous, very fragrant, petals 8; stamens numerous, anthers bright yellow, at 1500 m alt., Ilu-tepuí, March 10, 1952, *Maguire 33333* ♂; tree 10 m high, frequent, montane slopes at 2000–2300 m alt., Ilu-tepuí, March 16, 1952, *Maguire 33438*.

This most attractive tree is presently known only from Ilu-tepuí along the Venezuela-British Guiana frontier.

3. **Clusia tabulamontana** Maguire, Bull. Torrey Club **75:** 420. 1948.

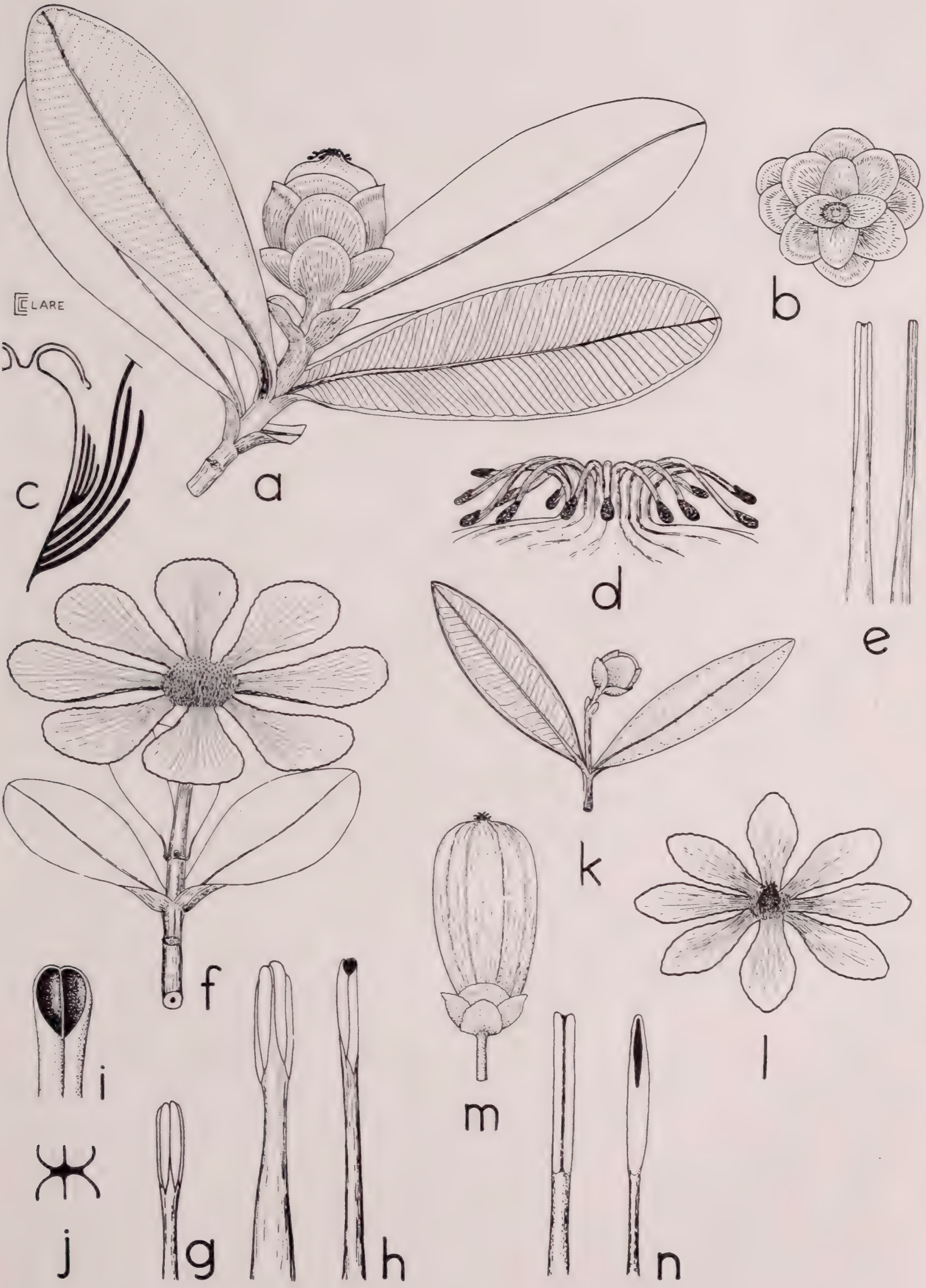
Type: small branched tree to 5 m high, petals white, fragile, crimped and erose along the margin, edge of Savanna V, Tafelberg, Suriname, Aug 16, 1944, *Maguire 24396* (holotype NY).

Known only from Roraima sediments, Talefberg, Suriname, where the small attractive tree is a prominent member of the cumbre flora.

4. **Clusia steyermarkii** Maguire, sp. nov. Figure 9.

Arbor parva; foliis coriaceis sessilibus oblanceolatis, 25–30 cm longis, 7–8 cm latis, apice late obtuso, basi angustata alata; inflorescentia foeminea (masculina ignota) triflora, congestata terminali; pedunculo erecto, ca. 5 cm longo; sepalis 9, inferioribus late ovatis, 10–13 mm longis, 10–15 mm latis, obtusis, (4)-jugatis decussatisque, superioribus (5) subimbricatis vel imbricatis, late ovato-oblongis, obtusis, 15–18 mm longis, 11–13 mm latis, scariosomarginatis; petalis ignotis; disco staminodiali ca. 1 mm alto, staminodiis 2–3-seriatis, linearibus, sterilibus, 4–6 mm longis; ovario 12-loculari; rostro stylari ca. 4 mm alto, stylis 12, partibus liberis 4–5 mm longis, stigmatibus sessilibus, distalibus ventralibus, oblongis ca. 3 mm longis; floribus masculinis ignotis.

FIG. 8. a–e, *Clusia phelpsiana* ♀. a, habit, fruiting specimen, × ½; b, view of calyx, from below, × ½; c, long-section diagram of ♀ flower (petals lacking); d, stylar apparatus; e, staminodia, ventral and lateral views, × 5; drawn from *Maguire 33332*. f–h, *Clusia phelpsiana* ♂. f, habit, flowering specimen, × ½; g, exterior stamen, × 5; h, interior stamen, ventral and lateral view, × 5; i, distal portion onf anther, lateral view, showing subterminal dehiscence, × 20; j, cross-section diagram through subterminal dehiscence pores; drawn from *Maguire 33438*. k–n, *Clusia parvifolia* ♀. k, habit, fruiting specimen, × 1; l, female flower, × 1½; m, mature fruit, × 1½; n, (probably fertile) staminodia ventral and lateral views, × 15.


CLARE
b
c
a
d
e
f
k
l
i
m
j
g
h
n

Type: tree 20–25 feet tall, leaves coriaceous; sepals white with reddish margins or reddish throughout; young fruit 3 cm in diam., ovoid-oblong, common along river, dense forest upper reaches of Río Tirica between Apácara and Torono-tepuí, Chimantá Massif at 1400 m alt., Edo. Bolívar, Venezuela, June 24, 1953, *Steyermark 75977* (holotype NY, isotype F).

Known only by the type collection, but said to be common by the collector. This species is strikingly characterized by its large narrowly oblanceolate sessile leaves.

5. **Clusia pusilla** Steyermark, Fieldiana Bot. **28:** 390. 1952.

? *C. cucullata* Klotzsch, nom. nud., in Schomburgk, Fauna und Flora von Britisch-Guiana 2: 1094. 1848.

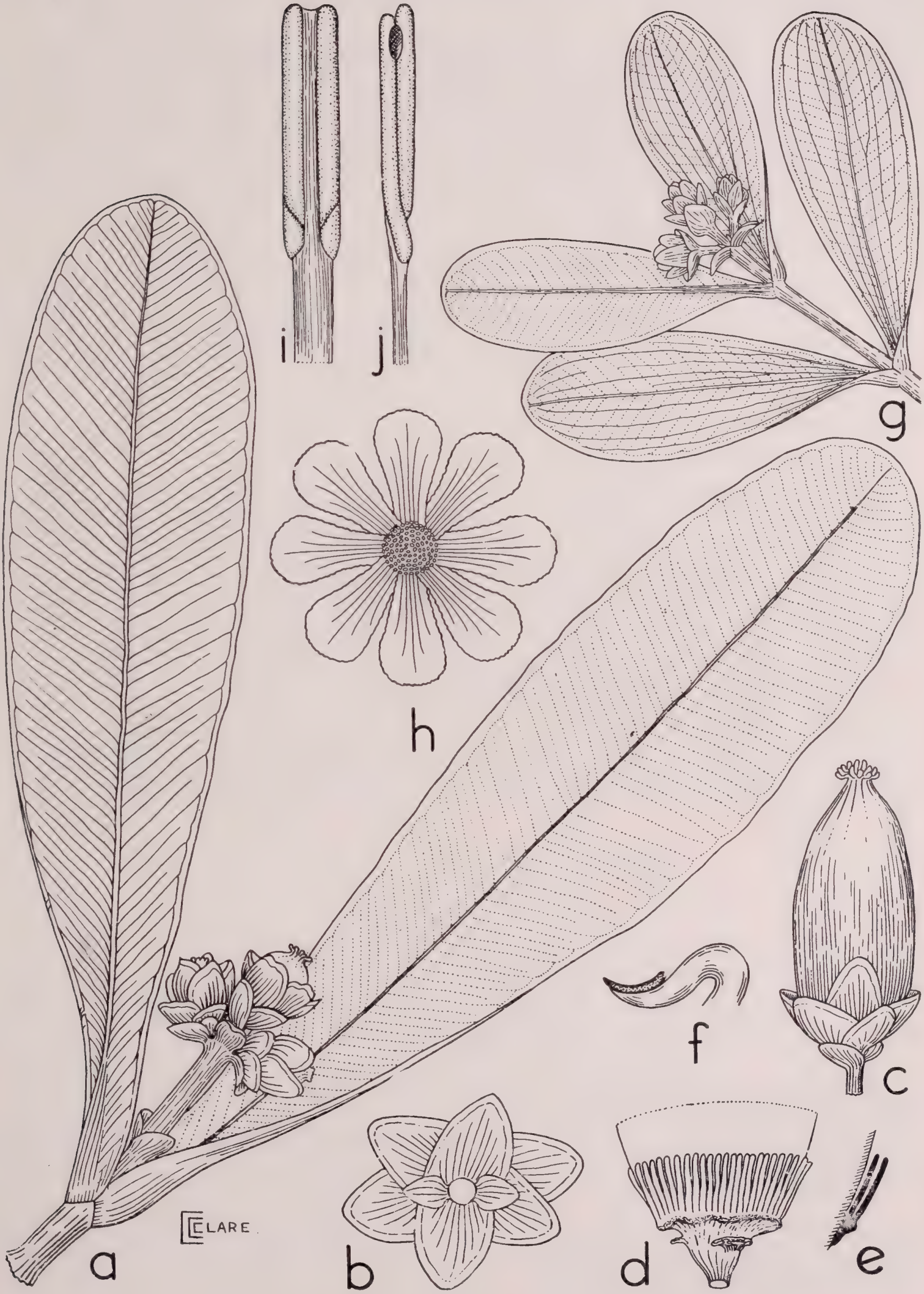
Small, usually low, rounded or spreading, densely branched tree, usually 1–4 m high; branches terete, sometimes somewhat fleshy, internode 1.5–4.0 (6.0) cm long; petioles 2–5 (8) mm long, conspicuously winged, sometimes the leaf sessile; blades variable, mostly 5–15 cm long, 3–8 cm broad, oblanceolate to broadly ovate-cuneate or cuneate, coriaceous, the midrib prominent, the lateral veins prominulous and ca. 2.5 mm apart, ascending at an angle of 40–60° and collected in a marginal vein 1–3 mm from the narrowly hyaline often pigmented involute margins; peduncles 3–6 cm long; cymes 1-flowered or 3 (sometimes 5)-flowered in the male plant, more often 1-flowered in female plant; bracts ordinarily a single pair, ovate, oblong, or obovate, 4–8 mm long; sepals 6–7, the lower pair decussate, the upper imbricate and hardly exceeding 12 mm in length; petals 8, white, oblanceolate, 2–3 cm long, 12–22 mm broad; stamens of the male flower numerous, the anterior 6–8 seriate, disposed on a disc ca. 1 mm high and 1.5 mm broad, the filaments 0.5–2.0 mm long, the anthers ca. 2 mm long, retuse at the apex, the filaments of the apical portion or receptacle subulate, ca. 3 mm long, the thecae 2, each lateral and bilocular, dehiscing by a subapical median elongate pore that reaches the middle of the anther; staminodia of the female flower numerous, several-ranked, 4.5–5.5 mm long, the anthers reduced in size and probably sterile; ovary ovoid, 8 (10)-locular, the cells many-ovuled, the ovules 2-ranked, horizontally arranged; styles 1–2 mm long, radiate, the stigmas 1.2–1.5 mm long, ovate, distally adnate, facing upwards.

Clusia pusilla is known only from the sandstone formations of Guayana, where it is the most widely occurring species of the section. The 33 collections now available show distinct patterns of differentiation, particularly in leaf-form, which coincide with broad geographical distribution, forming recognizably distinct but discontinuous populations or races in three major regions of Venezuelan Guayana.

The typical subspecies is confined to the drainage of the Río Caroní including the Gran Sabana and Cerro Guaiquinima. The two evidently most closely related races, at least those of most similar leaf form, occur in the extreme west where

---

FIG. 9. a–f, *Clusia steyermarkii* ♀. a, fruiting specimen, × ½; b, calyx, as seen from below, × 1; c, nearly mature fruit, × ¾; d, staminodial disc, × 1½; e, diagram through staminodial disc, × 2; f, detail of terminal portion of style showing placement of stigma, lateral view, × 5; drawn from *Steyermark 75977*. g, *Clusia amabilis* ♀, habit, post-flowering specimen, × ½; drawn from *Maguire & Maguire 40406*. h–j, *Clusia amabilis* ♂. h, male flower, × ¾; i, anther, ventral view, × 15; j, anther, lateral view, × 15; drawn from *Maguire & Maguire 40381*.


i
j
g
h
c
f
a
b
d
e
CLARE

on the sandstone plateaus of the Alto Orinoco drainage, viz., Cerros Duida, Parú and Sipapo, and to the east in the Pakaraima savannas of British Guiana and adjacent Venezuela, in the drainage of the Kamarang and Mazaruni Rivers.

Key to the Subspecies of *Clusia pusilla*

1. Leaves thickly coriaceous, cuneate or cuneate-obovate, (4) 5–7 (9) cm long, 3–5 (6.5) cm wide, broadly rounded or subtruncate at the apex, broadly cuneate at the base, the petiole 1–2 (3) mm long, the latex canals plainly visible; fruit oblong, 2.0–4.0 cm long, 1.8–2.0 cm broad; drainage of the Caroní. subsp. *pusilla.*

1. Leaves oblanceolate, the apex rounded or obtuse, the base narrowly cuneate, the latex canals obscure or not visible.
    2. Leaves (6) 8–10 (12) cm long, 3–5 (6) cm broad; fruit depressed-globose, globose, or oblong, 2–3 cm long, 1.5–2.2 cm broad; styles free to the base; drainage of the Mazaruni. subsp. *pakaraimae.*
    2. Leaves 10–15 (18) cm long, 6–8 (11) cm broad; styles tending to coalesce laterally near the base; fruit narrowly oblong, 3–5 cm long, 1.5–2.0 cm broad; drainage of the Alto Orinoco. subsp. *orinocensis.*

Clusia pusilla subsp. **pusilla.**

C. pusilla Steyermark, Fieldiana Bot. **28**: 390. 1952.

This lovely rounded, densely branched shrub or small tree reaches a height of 4 m, but more often is half or less that high. It is a conspicuous plant, generally distributed over the scrub savanna of the Gran Sabana and of Cerro Guaiquinima on the Río Paragua, where its symmetrical form, dark lustrous foliage, and numerous large fragrant white flowers make it, the name not withstanding, one of the most attractive plants of the region.

Type: dry rocky thickets, Gran Sabana, vic. Kavanayén, at 1220 m alt., Oct 26, 1944, Edo. Bolívar, Venezuela, *Steyermark 59396*.

Specimens examined: VENEZUELA: Edo. Bolívar, Gran Sabana: Kavanayén, Oct 26, 1944, *Steyermark 59396* (isotype NY); Kavanayén, *Maguire 33724* ♀; headwaters of the Kamarang, vic. Ilu-tepuí, *Maguire 33265* ♀, *33266* ♂; Cerro Guaiquinima, Río Paragua, 1600–2000 m alt., *Maguire 32894* ♀, *32993* ♀, *33009* ♀, *33011* ♀, *33065* ♀, *32923* ♂, *32994* ♂, *33010* ♂, *32837* ♂, *32924* ♂.

Clusia pusilla subsp. **pakaraimae** Maguire, subsp. nov.

Petioli 2–5 mm longi, late alati; laminis oblanceolatis (6) 8–10 (12) cm longis, 3–5 (6) cm latis, basi anguste cuneata; fructibus depresso-globosis vel oblongis, 2–3 cm longis, 1.5–2.2 cm latis; stylis ad basim liberis.

Type: dwarfed tree 0.5–2.0 m high, frequent, Imbaimadai Savannas, at 1200 m alt., Oct 24, 1951, *Maguire & Fanshawe 32231* ♀ (holotype NY).

Paratypes: BRITISH GUIANA: Pakaraima Mountains, Mazaruni River, Imbaimadai Savannas: *Maguire & Fanshawe 32197* ♀, *32289* ♀, *32301* ♀, *32313* ♀, *32314* ♀, *32309* ♂, *32230* ♂; Kamarang River, Holitipu savannas: *Maguire & Fanshawe 32515* ♀, *32515A* ♀, *32558* ♀, *32514* ♂. VENEZUELA: Gran Sabana, Kamarang Headwaters: *Maguire 33265* ♀, *33266* ♂.

Clusia pusilla subsp. **orinocensis** Maguire, subsp. nov.

Petioli 2–4 mm longi late alati; laminis 10–15 (18) cm longis, 6–8 (11) cm latis, basi cuneata; fructibus anguste oblongis, 3–5 cm longis, 1.5–2.0 cm latis; stylis ad basim ⅓–⅔ connatis.

Type: small tree with clear scanty latex, occasional, mixed montane woodland, Intermediate Camp at 600 m alt., Feb 2, 1948, Cerro Sipapo, *Maguire & Politi 28724* ♀ (holotype NY).

Paratypes: VENEZUELA: Territorio Amazonas, Alto Orinoco, Cerro Duida: *Maguire & Maguire 29575* ♀; Cerro Sipapo: *Maguire & Politi 27468* ♀, *27469* ♀; Cerro Parú, Río Ventuari, *Cowan & Wurdack 31182* ♀, *31282* ♀, *31389* ♀; Cerro Yutaje: *Maguire & Maguire 35072* ♀, *35098* ♀.

6. **Clusia amabilis** Maguire, sp. nov. Figure 9.

Arbor parva 3–6 dm alta; ramis teretibus tenuibus, latice albido; foliis subsessilibus, petiolis amplectantibus aliquantum alatis, 3–5 mm longis; laminis oblanceolatis coriaceis, 8–10 cm longis, 3–4 cm latis, apice obtuso-rotundato, basi acuta, costa prominenti, nervis lateralibus improminulis, canalibus laticiferis adscendenti-parallelis; inflorescentia foeminea terminali 3-flora; pedunculis 1.0–1.5 cm longis; bracteis inflorescentiae 1-jugatis; bracteis floris 1-jugatis, deltoideis, ca. 1 cm longis, 1 cm latis; sepalis 7, jugis duobus inferioribus appositis, late ovatis, ca. 15 mm longis, 10 mm latis, anguste marginatis, subacutis, cucullatis, superioribus subdecussatis vel imbricatis, subcarinatis, valde cucullatis, angustioribus; petalis 8; staminodiis numerosis, 2-seriatis, linearibus, 4–5 mm longis, sterilibus; ovario 5-loculari, valde sulcato; stylis in columna 2–3 mm longa adpressis, partibus liberis rotatis, ca. 2 mm longis, stigmatibus distalibus, ventralibus, ovatis, ca. 2 mm longis; inflorescentia masculina terminali, 3-flora, sepalis 7, a jugis bracteorum densis subtenta; sepalis inferioribus decussatis, late ovatis obtusis, superioribus subdecussatis vel imbricatis et subacutis, subcarinatis, valde cucullatis, ca. 1 cm longis; petalis 8, albidis, obovatis, 17–20 mm longis, 12–15 mm latis, crenatis erosique; staminibus numerosis, in disco humili introrsis dispositis, lineari-subclavatis, exterioribus 1.5–2.5 mm longis, interioribus ca. 3.5 mm longis; antheris 4-thecatis, sub apicem lateraliter dehiscentibus; fructibus non visis.

Type: shrubby tree 3 m high, latex white, flowers white, infrequent along water-course, west of Serra do Sol (Uei-tepuí) at 1200 m alt., Brazilian side of frontier, Terr. Rio Branco, Dec 29, 1954, *Maguire & Maguire 40381* ♂.

Specimens examined: *Maguire & Maguire 40381* ♂ (holotype NY); bushy tree 5 m high, latex white, infrequent along border of woodland at 2200 m alt., Serra do Sol (Uei-tepuí), Edo. Bolívar, Venezuela, Dec 29, 1954, *Maguire & Maguire 40406* ♀ (paratype NY).

Clusia amabilis is most closely allied to *C. pusilla*, in which the sepals are concave and orbicular, and the styles free to the base.

7. **Clusia schomburgkii** Vesque in DC. Monogr. **8:** 69. 1893.

Clusia roraimana Steyerm. Fieldiana Bot. **28:** 391. 1952.

Type: "Roraima" *Schomburgk 717.*

Specimens examined: BRITISH GUIANA. Kaieteur Plateau: *Jenman 1259* (K, photo NY); *Maguire & Fanshawe 23460* ♀ (K, NY, US), *23460A* ♀ (NY), *23461* ♀ (K, NY); Mt. Ebini, *Maguire 32125* ♀ (NY). VENEZUELA: Edo. Bolívar: "Roraima" *Schomburgk 717* (holotype P, isotypes G, K, V, NY); Abácapa-tepuí at 1300 m alt., *Steyermark 75199* (F, NY); Mt. Roraima, 1030–1115 m alt., *Steyermark 58606* (holotype of *C. roraimana* F, photo NY, isotype NY).

None of the type specimens of *C. schomburgkii* are well collected or preserved specimens. Primarily on the basis of foliar similarity, however, with some hesitation, *C. roraimana* Steyermark is brought under synonomy with *C. schomburgkii.* Likewise, similarity of vegetative character requires the assignment of the Kaieteur specimens cited above to that species.

8. **Clusia stylosa** Maguire, Bull. Torrey Club **75:** 419. 1948.

Type: common, *Clusia* bush, between Savanna VIII and southwest escarpment, Tafelberg, Suriname, *Maguire 24625* ♀ (holotype NY).

Known only from Tafelberg, where it is commonly distributed in dense low bush and about openings.

9. Clusia parvifolia Maguire, sp. nov. Figure 8.

Arbor flexuosa parva, ad 10 m alta; latice albido claro; ramis tenuibus, 1.5–2.0 mm diam., internodiis 5–8 mm longis; foliis ellipticis, 2–4 (4.5) cm longis, 14–18 mm latis, apice et basi acutis, costa prominenti, venis prominulis; petiolo brevissimo vel defecto; inflorescentia uniflora terminali; floribus foemineis solis visis; sepalis 6, decussatis, superioribus, ovato-rotundatis, 6–8 mm longis, non crassis, late scariosomarginatis; petalis 8, albis, oblongis, 10–12 mm longis, erosis; staminodiis clavato-linearibus, ca. 2 mm longis, pro parte fertilibus; ovario 8–10-loculari; fructu 15–18 mm longo, subcarnoso, oblongo; stylis 8–10, liberis, ca. 1.5 mm longis; stigmatibus distalibus, ca. 0.3–0.4 mm longis.

Type: flexuous tree 10 m high with scanty clear latex; petals white, narrowly obovate, ca. 15 mm long; styles ca. 10, elongate, stigmas cuneate, frequent, low *Clusia-Oedematopus* woodland, slopes of ridge east of Mesa Grande at 1650 m alt., Ilu-tepuí, Edo. Bolívar, Venezuela, March 9, 1952, *Maguire 33326* ♀ (holotype NY).

Paratypes: Ilu-tepuí, Edo. Bolívar, Venezuela. Small tree, frequent, woodland slopes of Mesa Ridge at 1600 m alt., March 11, 1952, *Maguire 33386* ♀; small straggly tree 10 m high, latex scanty, clearish; styles elongate, 8, arils orange-red, frequent, vicinity Camp No. 2, at 2000 m alt., March 20, 1952, *Maguire 33480* ♀.

Clusia parvifolia, like *C. cuneata*, is somewhat aberrant in sect. *Clusiastrum* in that it produces clear, scanty, merely whitish latex, and the flowers only 6 sepals in 3 decussate pairs. Otherwise the species is satisfactorily compatible with its relatives in *Clusiastrum*. Only pistillate trees were observed. The staminodia are pollen-bearing, at least some of them, and are probably functional.

10. Clusia cuneata Benth. Lond. Jour. Bot. **2:** 368. 1843.

C. riparia Sagot mms. and in litt.

Distinctive because of the linear-oblong fruit with a discoid rotate stylar apparatus, this species is set apart from the other members of the section. *C. cuneata* is the only representative of the group thus far known beyond the periphery of the sandstone areas of the Guayana Highland. It is coextensive with *C. crassifolia* Pl. & Tr. and with *C. pusilla* Steyerm. in the Pakaraima Mountain area of the Highland in western British Guiana and possibly adjacent Venezuela. Further, it is found in sandy mostly riverine sites in lowland British Guiana, French Guiana, and would seem likely to occur in intervening Suriname.

Specimens examined: BRITISH GUIANA: Upper Mazaruni River, *de la Cruz 2041* ♂ (NY), *2199* ♂ (NY), *2217* ♂ (NY), *2304* ♂ (NY); near Bartica, *Jenman 5021* ♂ (NY); Kaieteur Plateau and vicinity, *Maguire & Fanshawe 23012* ♂ (NY), *23325A* ♂ (NY), *23462* ♂ (NY); riverside, Coomaka, *Persaud 196* ♂ (NY); Rockstone, *Gleason 849* ♀ (NY); Kaieteur Plateau, *Maguire & Fanshawe 23295* ♀ (NY), *23325* ♀ (NY), *23463* ♀ (NY); Makreba Falls, *Maguire & Fanshawe 32385* ♀ (NY); Makreba Falls, *Pinkus 265* ♀ (NY); Moraballi Creek, *Sandwith 51* ♀ (K, NY). FRENCH GUIANA: "Acarouary" ("Karo-uany") *Sagot 70* (2 sheets, K); Godebert, Dec 20, 1820, *Wachenheim s.n.* (K); *Schomburgk 495* (type K, photo NY).

Species excluded from sect. *Clusiastrum: Clusia fragrans* Gardner; *Clusia sessilis* (Klotzsch) Engler; *Clusia plunkettii* Urban; *Clusia globosa* Maguire; *Clusia bracteosa* Cuatrecasas.

Clusia L. sect. **Cochlanthera** (Choisy) Engl. in E. & P. Nat. Pflanzenf. ed 2. **21:** 202. 1925; emend. Maguire.

Cochlanthera was proposed as a genus by Choisy (*Cochlanthera lanceolata*) in 1851, based upon the single collection *Funck & Schlim 714*, from Carabobo in the coastal Andes of Venezuela. This disposition was accepted by Planchon and Triana. However, in the *Epharmosis* (1892), Vesque aligned the plant generically with *Clusia,* replacing the specific epithet *lanceolata* (preoccupied by *C. lanceolata* Cambess. 1825) by the sectional name *cochlanthera.* The following year (1893) Vesque reversed his view by returning to the original disposition of *Cochlanthera* as a genus. Finally, in 1925, Engler (l.c.), taking up Vesque's first name, placed this extraordinary species under *Cochlanthera* as a section. I concur with this disposition.

The next species allied to *C. cochlanthera* to be discovered was obtained by Pennell (*2824*) in 1917 from Cundinamarca, and by Lawrance (*131*) in 1932 from Boyaca, both in the Eastern Cordillera of Colombia. Standley, apparently without recognizing its affinity, and without knowledge of the Pennell collection, designated *Lawrance 131* as the type of *C. orthoneura* Standl.

In 1944 Maguire on Tafelberg in central Suriname, and Cuatrecasas in 1943 and 1944 in the Department Valle on the Colombian Pacific Coast, collected respectively *C. lunanthera Mag.* and *C. centricupula* Cuatr., both of them failing to recognize the relationship of these two new species with "cochlearform" anthers.

And now my colleagues, Cowan and Wurdack, and I have collected on sandstone mountains in Amazonas, Venezuela, a fifth member of the section *Cochlanthera,* again in an area geographically and physiographically greatly disjunct from all the others.

Such disparate distribution of the five species, each apparently narrowly locally confined, suggests relictual status for the several members of the section, and historically perhaps a primary position for the section.

Sepals 7–8, the lower decussate, the upper imbricate; petals 8; stamens 15–∞, introrse (apparently extrorse in *C. cochlanthera*), 1–several-seriate, elevated on a short or elongate disc; anthers 4-celled, strongly recurved, hence lunate or reniform; central sterile mass conspicuous or essentially lacking. Perianth of the pistillate flowers similar; staminodia anantherous, forming a more or less coalesced 1–3-seriate ring; ovary 8-celled; ovules numerous; stigmas 8, cuneate, sessile, umbraculiform.

Often very large trees or epiphytic; leaves petioled, subcoriaceous; latex orange-colored or yellowish.

Type: *Clusia cochlanthera* Vesque.

Key to the Species of the Section *Cochlanthera*

1. Stamens comparatively few, 20 or less.
2. Stamens ca. 15, affixed to a broad disc in the center of which is a central 5-lobed sterile glutinous staminodial mass; lateral veins of the leaf ascending at 30–45°; leaf-blades lanceolate, 10–16 cm long. 1. *C. cochlanthera.*
2. Stamens ca. 20, affixed to the rim of a thick-walled cylinder 5–6 mm high, the central mass lacking; lateral veins of the leaf ascending at 70–75°; leaf-blades oblanceolate or obovate, 6–12 cm olng. 2. *C. orthoneura.*
1. Stamens comparatively numerous, 35–100.
3. Leaves with broadly winged clasping petioles; stamens about 35. 3. *C. centricupula.*
3. Leaves with slender non-winged petioles; stamens 75–100.
4. Branchlets terete; leaf-blades acute or abruptly acuminate at the apex. 4. *C. lunanthera.*
4. Branchlets sharply angled; leaf-blades obtuse at the apex. 5. *C. cochlitheca.*

1. **Clusia cochlanthera** Vesque, Epharmosis **3:** *pl. 67.* 1892.

Cochlanthera lanceolata Choisy, Mem. Soc. Phys. Genév. **12:** 426. *pl. 3.* 1851; not *Clusia lanceolata* Cambess. in St.-Hil. pl. Bras. Mer. **1:** 318. 1825; Vesque in DC. Monogr. **8:** 141. 1893.

Leaves lanceolate, subcoriaceous, acute or acutish at both ends, the costa prominent, the lateral veins prominulous, making angles of 30–45° with the midrib, the blade 10–16 cm long, 2.5–4.5 cm broad; petiole slender, (2) 3–4 cm long; staminate inflorescence 7–9-flowered, open; sepals 7–8, the lower decussate, the upper imbricate; petals probably 8; stamens ca. 15 in a single cycle, the filaments thickly filamentous, ca. 2.5 mm long, the anthers introrse 2-locular, outwardly recurved, ca. 2.5 mm long; centrally a 5-lobed glutinous staminodial mass; pistillate flowers unknown.

Type: alt. 4000 m, Puerto Cabello, Carabobo, Venezuela, June 1846, *Funck & Schlim 714*. Holotype Herb. Boissier, Geneva; isotype Herb. Delessert, Geneva.

Apparently *C. cochlanthera* has not been again collected.

2. **Clusia orthoneura** Standl. Field Mus. Publ. Bot. **22:** 91. 1940.

Medium-size tree, 12–18 m high, the branchlets slender, scurfy-rimose, sulcate when dry; leaf-blades oblanceolate, coriaceous, acuminate or merely obtuse at the apex, acute at the base, 6–12 cm long, 2.5–3.5 cm broad, the midrib extending to the middle of the blade, the lateral veins prominulous, ascending at angles of 75–80° and parallel above; petiole 8–14 mm long; inflorescence open, (1) 5–7-flowered; sepals apparently 6; petals apparently 6, ca. 3 cm long, obovate, "pinkish white"; staminal column ca. 6 mm high, 7 mm thick, glutinous, thick-walled, the central cavity narrow, the central staminodial mass lacking; stamens extrorse, ca. 20, the filaments 6–7 mm long, the anthers 2.5 mm long, strongly incurved; pistillate flowers unknown.

Type: epiphytic tree 40–60 ft high, 2–3 inches diam., petals pinkish-white; stamens yellow, a very sticky substance collected at base; at 3600 ft alt., Mt. Chapon, nw Bogotá, extreme western part of Dept. Boyaca, Colombia, June 2, 1932, *A. E. Lawrance 131.*

Specimens examined: *Lawrance 131* (isotypes K, NY); tree, petals pinkish-white, forest above Pandi at 1800–2000 m alt., Dec 1–3, 1917, *F. W. Pennell 2824* (NY).

Clearly, in the sect. *Cochlanthera, C. orthoneura* stands next to *C. cochlanthera*, as indicated by the comparatively few stamens. The leaf character of *C. orthoneura* is unique in the section.

3. **Clusia centricupula** Cuatr. Rev. Acad. Colomb. **8:** 56. 1950.

Type: arbol epífito; flor rosada, bosque 5–20 m alt., Puerto Merizalde, Río Naya, Costa del Pacífica, Dep. Valle, Colombia, Nov 22, 1943, *Cuatrecasas 14043* (holotype F, isotype NY). Paratype: arbolito epífito. Hoja craso coríacea, verde amarillento clara. Flor rosada, Veneral bosque 5–50 m alt., Valle, Jan 30, 1944, *Cuatrecasas 15776* (F).

Apparently known only by the two type collections.

4. **Clusia lunanthera** Maguire, Bull. Torrey Club **75:** 431. 1948.

Type: tree 12 m high, 15 cm diam., latex orange, copious, petals totally white, the flowers 8–10 cm diam., frequent, high bush about rim of Arrowhead Basin, Tafelberg, Suriname, Aug 20, 1944, *Maguire 24422* ♂.

Specimens examined: SURINAME: Tafelberg, *Maguire 24422* ♂ (holotype NY); Arrowhead Basin, *Maguire 24428* ♀; East Ridge, *Maguire 24586* ♀; Savanna VIII, *Maguire 24546* ♀.

Known only from the Tafelberg, where it is a conspicuous member of the summit flora.

5. Clusia cochlitheca Maguire, sp. nov.

Arbor mediocris; ramulis acute angulatis, internodiis 2–4 cm longis; foliis grandibus, laminis valde chartaceis, ellipticis vel elliptico-oblanceolatis, 12 cm vel vulgo 18–25 cm longis, (7) 8–12 cm latis, costa prominenti, venis lateralibus prominulis ad angulos 20–25° adscendentibus, apice obtuso vel aliquantum acuto, basi acuta vel acuminate brevi-decurrenti; petiolis crassis, 4–5 mm latis, 1.5–3.0 (4.0) cm longis; inflorescentia 1–3-flora; floribus masculinis: sepalis 8, duobus jugis inferioribus decussatis, superioribus subimbricatis, valde scariosomarginatis, inferioribus late ovatis, 15–20 mm latis, 12–15 mm longis, superioribus orbiculari-oblongis vel oblongo-oblanceolatis, 20–16 mm latis, 20–26 mm longis; petalis 8 obovato-oblanceolatis, aliquantum panduriformibus, 3–6 cm longis, 3–4 cm latis, albis; staminibus numerosis, 75–100, 3–5-seriatis, extrorsis, in annulo 1.0–1.5 mm alto dispositis, filamentis ad basim compressis, ca. 8–10 mm longis, antheris 1.5–1.8 mm longis, 4-thecatis, valde recurvatis; staminodiis in massa centrali 7–10 mm diam., 1.0–1.5 mm alta aggregatis; floribus foeminis: sepalis 8–10; petalis 8; staminodiis 1–2-seriatis, in corona 4–5 mm alta connatis, anantheris; ovario 8-loculari; stigmatibus 8, sessilibus umbraculiformibus, cuneatis, 5–7 mm longis; fructu maturo non visi, probabiliter 3 cm longo.

Type: tree 20 m high, 40 cm diam., cymes 1–3-flowered, sepals white or pinkish, petals 8, wholly white, anthers white, frequent in upper montane woodland at 1300 m alt., Dec 4, 1950, Cerro Huachamacari, Terr. Amazonas, Venezuela, *Maguire, Cowan & Wurdack 29832* ♂.

Specimens examined: Cerro Huachamacari: *Maguire, Cowan & Wurdack 29832* ♂ (holotype NY); tree 30 m high, 50 cm diam., at 1300 m alt., *Maguire, Cowan & Wurdack 29831* ♀ ;, small tree, at 1200 m alt., *Maguire, Cowan & Wurdack 29864* ♀ ; tree 20 m high, at 1000 m alt., *Maguire, Cowan & Wurdack 29965* ♀ ; tree 10 m high, at 1800 m alt., *Maguire, Cowan & Wurdack 30185* ♀. Tree 7 m high, occasional at 2000 m alt., Cerro Parú, Terr. Amazonas, Jan 31, 1951, *Cowan & Wurdack 31073* ♂.

MYRTACEAE[19]

(*Calyptranthes* and *Marlierea*)

Recent collections of plants from northern South America, especially those made by expeditions from the New York Botanical Garden, the Chicago Natural History Museum, and the United States Department of Agriculture, have included numerous specimens of the family Myrtaceae, a great many of which have proved to be new to science. Study of the myrtaceous flora indicates that in the area north of the Amazon River, and south and east of the Orinoco, there is a considerable amount of local endemism. In the two genera considered in this paper, for example, together with approximately 40 species in the region, only about one-tenth of the species are known to range beyond the borders of the Guayana area, and none is widespread elsewhere.

The genera *Calyptranthes* and *Marlierea* are well known in South America east of the Andes and as far south as Uruguay. They have been considered as relatively ''good'' genera because of the distinctive features of the calyx, which is calyptrate and circumscissile in *Calyptranthes*, and opening by irregular longi-

---

[19] By Rogers McVaugh.

tudinal slits in *Marlierea*. These two genera were early recognized as distinct from *Myrcia* (including *Aulomyrcia*) which possesses well-formed, separate and usually markedly imbricate calyx-lobes which are persistent and do not split irregularly in the sinuses. At the time of Berg's monumental revisions of American Myrtaceae (1855–1859) he knew a total of 69 species of *Calyptranthes* and 29 species of *Marlierea*, all of which were reasonably well set off from the 424 species of *Myrcia-Aulomyrcia* which he recognized. As more material has become available, however, particularly from northern South America, it has become increasingly apparent that the generic lines in the Myrciinae (the subtribe which includes the genera just discussed) are not entirely sharp.

A majority of the species of *Myrcia* have well-formed calyx-lobes which change little from the flowering to the fruiting condition; the lobes are usually broadly rounded, markedly imbricate in bud and in flower, and scarcely separated at base even in fruit; the hypanthium may or may not be prolonged into a cuplike or cylindric structure which surmounts the ovary and the fruit, the distal margin of the hypanthium rarely splits between the calyx-lobes, and the structure as a whole often persists as a short cylinder with nearly parallel sides, terminating in the spreading calyx-lobes.

In *Calyptranthes* the buds are completely closed and often apiculate, opening by a calyptra which usually remains attached by a narrow band of tissue at one side. Dehiscence of the calyptra follows a line parallel to the line of insertion of the stamens, and just above this line.

In the original species of *Marlierea* the buds are closed and apiculate as in *Calyptranthes*, or in a few species barely open at the tips, with very short and imperfectly developed calyx-lobes. The buds open by four or five irregular longitudinal slits which extend from the tip of the bud down at least to the distal margin of the zone of insertion of the stamens and sometimes well into or beyond this zone. The irregularly shaped 'calyx-lobes'' which result from this splitting probably include in every instance the tip of the calyx proper, and at the base a portion of the hypanthium. In many species there is evident, in addition to the splitting of the hypanthium, a tendency for this structure to become explanate: the tube of the hypanthium, which in flower is regularly much prolonged beyond the summit of the ovary (i.e. beyond the level at which the style arises) becomes flattened or merely somewhat concave at the center, and the irregular lobes widely spreading or reflexed, and often ultimately deciduous.

These differences may be summarized as follows:

	Calyx (bud)	Lobes	Hypanthium	Lobes separate in fruit	Calyx Persistent
Myrcia	Open: Distinct lobes	as in bud	Not splitting	No	Yes
Marlierea	Closed or minute lobes	irregular after splitting	Splitting Explanate	Yes or deciduous	Weakly
Calyptranthes	Closed	None (calyptra)	Not splitting Tubular		Calyptra sometimes

The above distinctions were essentially those used by Berg in contrasting these genera, which are otherwise much alike in vegetative characters and in characters of flowers and fruit. It has recently been emphasized anew, however, that certain distinctive characters reside in the inflorescence.[20] In the subtribe Myrciinae the inflorescence is usually a compound or decompound panicle with more or less elongate lower branches and the flowers mostly appearing to be clustered in groups of three near the tips of the panicle-branches. In the genus *Myrcia* the principal axis of the panicle is as long as or longer than the primary lateral branches, and the panicle as a whole is about as long as wide. In *Marlierea* and *Calyptranthes,* on the other hand, in a majority of the known species, the principal axis of the panicle shows a strong tendency to abort immediately above the lowest node. The inflorescence, as a result of this, consists of a very short central axis terminated by an abortive bud and with a pair of nearly equal, and elongate flowering branches arising from the node just below the terminal bud. These paired "panicles" in *Calyptranthes* and *Marlierea* are, of course, the homologs of the lowest panicle-branches in *Myrcia.*

In *Myrcia* the inflorescence is usually axillary (sometimes appearing terminal because the panicles surpass the leaves at the uppermost node); no morphological distinctions have been observed between axillary and terminal panicles. In *Marlierea* and *Calyptranthes,* however, the inflorescence may be (and usually is) axillary, or may be terminal on the same plant. It has not been possible to verify the following observation for all species of any of the genera in question, but it now seems that the occurrence of a terminal panicle is rare in *Myrcia* and rather common in the other two genera. The terminal panicle (as contrasted to the falsely terminal condition often seen in *Myrcia*) is formed as a prolongation of a shoot which is leafy below and not by development of an axillary bud at the terminal node of the shoot. In *Marlierea* and *Calyptranthes* the terminal panicles are usually indistinguishable from those of *Myrcia,* whereas the axillary panicles more often tend to exhibit the paired condition resulting from abortion of the axis. In *Calyptranthes* at least, the tendency for the abortion of the axis may be carried over to the vegetative branches, with suppression of the central axes and continued growth of the axillary branches, so that the genus may often be recognized from sterile material by the repeated forking of the branchlets.

A further distinction between *Myrcia* on the one hand, and *Marlierea* and *Calyptranthes* on the other, may be found in the distinctive pubescence of the latter two genera. In these (as also in some species of *Eugenia*) the pubescence in many species is at least partly of two-branched hairs which usually lie closely appressed to the surface and are often attached very near to one end so that their two-branched condition is apparent only upon close inspection. Hairs of this kind occur frequently in *Calyptranthes* and often in *Marlierea,* but I have not observed them in *Myrcia.*

The principal genera in the Myrciinae are thus delimited by at least three sets of characters which indicate that *Myrcia* is amply distinct from *Marlierea* and *Calyptranthes;* these latter genera, on the basis of the same characters, are more closely related. From study of recently discovered species it is now apparent that there is hardly any real distinction between *Marlierea* and *Calyptranthes,* so that the line between them must often be drawn rather arbitrarily; it is further apparent that the line between *Marlierea* and *Myrcia* is not always easy to draw.

---

[20] Fieldiana Bot. 29: 152–161. 1956.

In certain species of *Marlierea* and *Calyptranthes* the branchlets are two-winged or two-keeled; in these species the genera may be readily distinguished even in sterile specimens because the orientation of the wing differs with respect to the position of the leaves (see key, below). Except in these species, however, the genera are distinguishable by calyx characters only. The distinction is not difficult if the calyptra dehisces cleanly, without further splitting of the calyx or hypanthium; the undoubted species of *Calyptranthes* behave in this way. In a ''typical'' species of *Marlierea,* likewise, the closed or nearly closed buds open by irregular longitudinal fractures resulting in four or five nearly equal lobes. In various other species, however, most of which have been assigned at one time or another to *Marlierea,* there are irregularities in the opening of the calyx. These irregularities are of two principal kinds:

(1) The closed bud opens irregularly, but one of the divisions is somewhat or much larger than the others, simulating a calyptra. This calyptra-like lobe may remain attached at one side, as in *Calyptranthes.* The other, smaller lobes may persist or may be deciduous soon after anthesis. The prolonged rim of the hypanthium may remain entire, or (usually) become irregularly lobulate, as in *M. suborbicularis.* In *M. salticola* the calyx is definitely calyptrate, without accompanying small lobes, but the species is assigned to *Marlierea* because after the abscission of the calyptra the margin of the hypanthium is recurved and becomes irregularly lacerate-lobed.

(2) The calyx is incompletely closed in bud, with short lobes which separate as the flower opens. The difficulty here is to find a suitable distinction, on this character alone, between *Marlierea* and *Myrcia.* When the calyx-lobes are initially very small and the buds are almost entirely closed, the opening of the flower initiates a major transformation in which the splitting of the calyx and hypanthium extends nearly the whole length of the bud, and the hypanthium is often much distorted and flattened. These species can be assigned without question to *Marlierea.* In certain other species, however, e.g. in *M. bipennis, M. guildingiana,* and two newly described species, the calyx-lobes are relatively large in proportion to the size of the bud; the splits between the lobes are not extensive, so that the lobes are not widely separated; the tube of the hypanthium does not become explanate but remains cylindrical in flower and in fruit; the fruit, in fact, crowned by the ring of the hypanthium-tube and the persistent rounded calyx-lobes, resembles the fruit of various species of *Myrcia.*

I do not think, therefore, that in doubtful cases a distinction should be made between *Myrcia* and *Marlierea* on the basis of calyx-characters alone. A proper decision may depend upon study and correlation of the combined characters of calyx, inflorescence and pubescence.

The distinction between *Marlierea* and *Calyptranthes* is even more difficult, and often impossible unless opening buds are available for study. It is therefore difficult to construct a practical key for the identification of the species of these two genera, and in the present paper the two genera have been keyed out together, with minimal dependence placed upon the technical characters which separate the groups.

From the taxonomic standpoint a botanist with tendencies toward ''lumping'' might be tempted to combine *Marlierea* and *Calyptranthes.* As a practical matter I do not favor such a course, because in the first place it would tend to weaken the distinction between the combined genera and *Myrcia,* and in the second place because such a combination would tend to obscure the very real differences between *Calyptranthes* and the other genera of the Myrciinae. In most parts of its range, as throughout Mexico, Central America, the West Indies, Andean South America, and probably in southeastern Brazil, *Calyptranthes* ranks among the most distinctive of genera. As far as I know the troublesome, intermediate species are confined to northern South America east of the Andes, and the flora of this area is relatively so poorly known that any combination of doubtful genera should await much further study.

The key which follows includes the species of *Calyptranthes* and *Marlierea* known to me from the area between the Amazon and Orinoco Rivers, and from Colombian Guayana. Species known only from the Amazon Valley of Brazil or Peru are not included. All the species included in the key are listed in alphabetical sequence, but complete descriptions are not provided for previously known species unless such descriptions are unavailable elsewhere.

Relatively few species of these genera are known from the northern Andes and from other areas in northern and western Colombia and northern Venezuela. These species, without any exception that has come to my attention, are either endemic or have their closest relatives in Central America or the West Indies. They constitute a group sufficiently distinct from the species of the Guayana area, and should be studied in detail as soon as enough material becomes available.

Key to the Species of *Calyptranthes* and *Marlierea*

1. Branchlets 2-winged or 2-carinate, the wing up to 1 mm wide, evident in branchlets of the current season but often wanting in older twigs.
    2. Distal ends of the wings terminating between the leaf-bases at opposite sides of a node (*Calyptranthes* type); buds 2–3.3 mm long, opening by a calyptra.
        3. Leaves acuminate, elliptic-ovate, 5.5–10 cm long, 2.2–3 times as long as wide. 6. *C. lucida.*
        3. Leaves rounded or obtuse at the apex, obovate to broadly elliptic or ovate, 2.5–5.5 cm long, 1.5–2.5 times as long as wide.
            4. Leaves obtuse to rounded or subcordate at the base, relatively broad (less than twice as long as wide); panicles 3 times compound, 30- to 40-flowered. 12. *C. pullei.*
            4. Leaves acute or cuneate at the base, broad or narrow; panicles reduced, 5- to 20-flowered, often spike-like with the flowers sessile along the branchlets. 11. *C. pulchella.*
    2. Wings or keels terminating distally in the median lines of the leaf-bases and usually decurrent upon the keeled or angled petioles (*Marlierea* type); buds 2–5 mm long, calyptrate or the calyx with 4 (–5) short free tips, the hypanthium splitting irregularly longitudinally in anthesis.
        5. Buds about 5 mm long, probably closed and apiculate, covered with appressed golden-brown hairs, the plant generally pubescent; wings of the branchlets up to 1 mm wide; leaves 15–22 cm long, acuminate; Suriname. 18. *M. biptera.*
        5. Buds 2–3 mm long; plants pubescent or glabrous; branchlets with wings 0.5–3 mm high (or merely keeled in 2 species); leaves various.
            6. Buds 3 mm long, appressed-pubescent, closed and apiculate; plants sparsely pubescent with brown sessile hairs; branchlets keeled; leaves 17 cm long, acuminate; Suriname. 33. *M. multiglomerata.*
            6. Buds 2–3 mm long, glabrous; free tips of the calyx 0.5 mm long, infolded over the apex until anthesis; plants glabrous or very sparingly pubescent with bright rufous hairs; branchlets narrowly winged, or merely keeled in 1 species; leaves various.

7. Leaves 7–22 cm long, acute or acuminate; petiole 3–6 mm long; at least the vegetative buds and young shoots markedly pubescent; branchlets winged or angled.

8. Branchlets winged, the wings 0.5–3 mm high; leaves merely acute or shortly and obscurely acuminate; petiole 3–4 mm long; Rio Negro (Brazil) to Río Casiquiare (Venezuela). 17. *M. bipennis.*

8. Branchlets obscurely or acutely angled, or subalate, the wing much less than 0.5 mm high; leaves narrowly or abruptly acuminate; petiole 5–6 mm long; British Guiana to Trinidad and St. Vincent. 25. *M. guildingiana.*

7. Leaves 2.5–6 cm long, obtusely pointed or rounded at the apex; petiole 1–3 mm long; pubescence various; branchlets narrowly winged; Guayana.

9. Plants (except the vegetative buds) completely glabrous; leaves 1.5–2.5 cm wide, elliptic, 2.3–3 times as long as wide. 28. *M. karuaiensis.*

9. Young shoots and inflorescence thinly pubescent; leaves 0.3–1.6 cm wide, mostly lanceolate, 4–9 times as long as wide. 31. *M. maguirei.*

1. Branchlets compressed or terete, neither winged nor prominently carinate.

10. Relatively glabrous plants with short petioles, small obtuse or bluntly pointed leaves (caudate-acuminate in *M. schomburgkiana*) and small glabrous flowers [petioles 2–3 (–5) mm long; leaves 3.5–8 (–13) cm long; buds glabrous (or nearly so in *M. salticola*), 3–3.5 (–5) mm long].

11. Leaves lanceolate to oblanceolate or narrowly elliptic, 1–2 cm wide, 3–4.5 times as long as wide, acute at the base; panicles 5- to 9-flowered; buds 4 mm long, with an attenuate red-strigose base; British Guiana. 34. *M. salticola.*

11. Leaves elliptic to ovate or suborbicular, if acute at the base then 2–2.5 times as long as wide, the flowers usually more numerous and the buds glabrous and 3–3.5 mm long.

12. Leaves prominently acuminate; inflorescence-branches glabrous or essentially so.

13. Leaves caudate-acuminate, the linear tip (1–) 1.5–2.5 cm long, 1–1.5 mm wide; midvein convex above; panicles 5- to 7-flowered, the flowers mostly terminal and slender-pedicellate; Guianas. 35. *M. schomburgkiana.*

13. Leaves deltoid-acuminate, the acumen mostly less than 1 cm long; panicles many-flowered.

14. Midvein impressed. 10. *C. paniculata.*

14. Midvein convex above. 5. *C. florifera.*

12. Leaves rounded, obtuse, or obscurely acuminate at the apex; leaves broadly rounded or cordate at the base or, if acute, the flowers 30 or more in each panicle, the midvein flat or convex above, and the inflorescence often notably pubescent.

15. Leaves subsessile, broadly rounded and subcordate at the base, 6–13 cm long, 1.5–1.7 times as long as wide; inflorescence spikelike, each spike 9- to 12-flowered, the flowers sessile and mostly in one terminal cluster; style 10–12 mm. long; buds 4–5 mm long; lower Rio Negro, Brazil. 16. *C. spruceana.*

15. Leaves (2–) 3–8 (–10) cm long, variously shaped; inflorescence paniculate, loosely branched, each panicle 10- to 35-flowered, the flowers solitary or in 3's near the tips; style 3.5–6 mm long; buds 3–3.5 mm long.

16. Leaves subsessile, broadly rounded to cordate at the base; petioles 2–3 (–4) mm long, 1.5–2.5 mm thick; hypanthium relatively thick and coriaceous with large persistent lobes, the margin neither thin nor uniformly reflexed; staminal ring coarsely bristly.

17. Buds fleshy, coarsely wrinkled in drying; 3-flowered peduncles relatively stout, 1–1.3 mm wide, 4–7 (–12) mm long; calyx calyptrate, the calyptra deciduous, the hypanthium margin becoming irregularly 5- to 8-lobulate; Venezuela (Río Guainía) 37. *M. suborbicularis.*

17. Buds not wrinkled or but obscurely so in drying; 3-flowered peduncles slender, 1 mm wide or (usually) less, (7–) 10–20 mm long; calyx usually not definitely calyptrate but splitting irregularly longitudinally, the 3–4 lobelike segments reflexed and persistent; Guianas. 32. *M. montana.*

16. Leaves acute or sometimes rounded at the base, with short but definite petioles 3–5 mm long; margins of the hypanthium very thin, and in anthesis abruptly and narrowly revolute; staminal ring glabrous.
  18. Inflorescence glabrous, only the vegetative buds silky with appressed white hairs; leaves rigidly coriaceous, obtusely pointed; inflorescence-branches stout, the 3-flowered peduncles 0.7–0.8 mm wide. 29. *M. ligustrina.*
  18. Inflorescence and branchlets sparingly pubescent with pale or reddish erect hairs; leaves thin, papery when dry, acute or short-acuminate; inflorescence branches slender, the 3-flowered peduncles less than 0.5 mm wide.
    19. Buds much darkening in drying; inflorescence densely pubescent, its branches contrasting with the glabrous buds; leaves 5–10 cm long, often 2.4–3 times as long as wide. 8. *C. multiflora.*
    19. Buds pale yellow brown in drying, not darkening; inflorescence sparsely pubescent or almost glabrous; leaves 2.5–5.5 (–13) cm long, about twice as long as wide. 5. *C. florifera.*

10. Plants mostly with larger and often acuminate leaves (8–15 cm long or more), longer and/or slender petioles (6–10 mm long or more), and abundant pubescence (flowers velutinous or canescent or abundantly appressed-pubescent if the leaves and petioles are both shorter than above).
  20. Buds glabrous without, the inflorescence glabrous or sparingly pubescent or puberulent.
    21. Buds 4–5 mm long, closed, broadly obovoid or subglobose; plants coarse, the leaves 14–22 cm long, with relatively short stout petioles 2.5–3.5 mm thick, 5 mm long; midvein flat or convex above; panicles about 15 cm long, nearly glabrous; British Guiana. 30. *M. macrophylla.*
    21. Buds 2–4 mm long, with short separate and distinct calyx-lobes, mostly narrowly obovoid; leaves 6–12 (–17) cm long, the midvein narrowly impressed; panicles pubescent or puberulent, 3–10 cm long; petioles longer in proportion, 4–10 mm long, transversely rimose and corky-thickened at least in the proximal half, the outer layers separating and persistent.
      22. Leaves elliptic-obovate, about 2.5 times as long as wide, acute at base; lateral veins 8–10 pairs; inflorescence puberulent, branching somewhat irregularly, forking and zigzag, with persistent short lateral branchlets; bracts early deciduous; British Guiana. 24. *M. gleasoni.*
      22. Leaves elliptic-lanceolate, 3–4.5 times as long as wide, acute to rounded at base; lateral veins 20–25 pairs; inflorescence thickly and finely appressed-pubescent, the flowers mostly sessile along straight divaricate and much elongated lower branches of the panicle; bracts somewhat persistent; Amazonian Brazil to eastern Colombia and adjacent Venezuela. 39. *M. umbraticola.*
  20. Buds markedly pubescent, canescent, velutinous or hirsute, the hairs usually covering the entire bud but sometimes confined to the proximal half (the base of the hypanthium); inflorescence with a covering of hairs like those of the buds.
    23. Panicles 1–2 (–3.5) cm long (a ''panicle'' here refers to one of the paired panicles arising from the one node of an abortive axillary axis. or the opposite panicles from the lower nodes of a terminal axis); flowers 3–8 (in 1 species –20) in each panicle, sessile or short-pedicelled, clustered near the end of a short unbranched peduncle or a few lateral or basal, the lateral branches of the panicle mostly undeveloped (in 1 species known in bud only, the lateral branched present, reduced).
      24. Panicles about 20-flowered (seen in bud only), 2 cm long, branched from near the base, the longest internode 1 cm long; peduncle almost none; panicle-branches coarsely and persistently bracteate; buds 3–3.5 mm long, obovoid to subglobose, at least the base persistently velutinous with reddish-brown hairs; British Guiana. 13. *C. smithii.*
      24. Panicles 3- to 8-flowered, most of the flowers clustered at the summit of the pedicle 3–10 (–30) mm long. sometimes with a pair of very short 1-flowered branches near the base or middle of the peduncle

25. Buds closed, narrowly ovoid, 4–5 mm long, hirsute and completely obscured by pale brown hairs 1–1.5 mm long; panicles 3- or 5-flowered, the peduncle 3–6 mm long, scarcely evident; two lateral flowers, if present, at the base of the peduncle; midvein convex on both surfaces; British Guiana. 9. *C. ovoidea.*

25. Calyx with distinct lobes in bud or, if closed, the buds 1.7–2.5 mm long; peduncle evidently elongated and longer than the flowers, 7–10 mm long or longer; lateral flowers, if present, near the middle of the peduncle; midvein usually impressed above (sometimes merely channeled in *C. fasciculata*).

26. Calyx-lobes distinct in bud, 1–1.8 mm long, the calyx splitting irregularly longitudinally in anthesis and the lobes subpersistent; leaves thick, rigidly coriaceous, the lateral veins scarcely apparent in dried leaves.

27. Leaves caudate-acuminate; plants densely pubescent with very numerous closely appressed bright rusty-brown hairs 0.1–0.2 mm long. 38. (reduced forms of) *M. summa.*

27. Leaves obtusely pointed; plants heavily velutinous with tangled flexuous reddish to white hairs 0.5–1.3 mm long. 19. *M. buxifolia.*

26. Calyx calyptrate, closed, the calyptra deciduous; leaves acuminate, thinner, the lateral veins numerous and closely parallel; plants pubescent with pale brown hairs (up to 0.4 mm long) overlying appressed pale matted hairs. 4. *C. fasciculata.*

23. Panicles 5–15 cm long or more, with well-developed lateral branches (or in a few species spicate) and numerous (usually 10–30) flowers.

28. Panicles 5–10 cm long (2 cm in *C. smithii*), branched from well below the middle and usually with 1 or 2 supernumerary branches from each node in addition to the principal branch; bracts somewhat persistent, lanceolate to ovate, sometimes keeled, 2–5 mm long; buds closed, 2.5–4 mm long, obovoid, calyptrate, appressed-pubescent (or velutinous at the base) with reddish-brown hairs to 0.5 mm long; plants often dioecious.

29. Leaves 9–12 cm long; inflorescence (known in bud only) 2 cm long; British Guiana. 13. *C. smithii.*

29. Leaves (15–) 20–30 cm long or more; inflorescence 5–10 cm long.

30. Leaves tapering to a slender apex from the middle or below; inflorescence 5 cm long or less, few-flowered; Amazonian Brazil to southwestern Venezuela. 7. *C. macrophylla.*

30. Leaves abruptly and narrowly acuminate; inflorescence 6–10 cm long, many-flowered; Guianas. 14. *C. speciosa.*

28. Spikes (in 1 species) or panicles 4–15 cm long, with open opposite or subopposite branching; bracts small, usually deciduous much before anthesis; buds and pubescence various.

31. Inflorescence spikelike, the individual spikes 8–10 cm long, 12- to 15-flowered; buds closed, calyptrate, 4.5–5 mm long, heavily strigose with yellowish- or rusty-brown hairs; Suriname. 15. *C. spicata.*

31. Inflorescence paniculate, mostly 2 or 3 times compound.

32. Pubescence of very numerous minute closely appressed bright rusty brown dibrachiate persistent hairs 0.1–0.2 mm long; leaves rigidly coriaceous; calyx-lobes free in bud; buds 3.5–5 mm long; Guayana (Venezuela), at elevations of 1400–1900 m.

33. Leaves caudate-acuminate, 2.5–5.5 times as long as wide. 38. *M. summa* var. *summa.*

33. Leaves obtuse or bluntly short-acuminate, 1.7–2.4 times as long as wide. 38. *M. summa* var. *superior.*

32. Pubescence often partly deciduous, variously colored, some or all of the hairs 0.5–1 mm long or more, appressed or spreading; leaves and flowers various.

34. Lateral veins impressed above, 12–20 pairs, readily counted and much stronger than the intermediate veins; leaves rigidly coriaceous,

14–25 cm long, pubescent and/or very finely bullate beneath; buds not seen; inflorescence, including the fruit, heavily velutinous with pale brownish-yellow or golden-brown hairs 0.5–1 mm long.

35. Leaves pubescent and finely bullate beneath, 5–7 cm wide, more than twice as long as wide; marginal vein 1.5–2.5 mm from the margin; petiole 2 cm long; Venezuela (Chimantá). 27. *M. intonsa.*

35. Leaves merely pubescent beneath, 7–13 cm wide, usually less than twice as long as wide; marginal vein 3–6 mm from the margin; petiole 1 cm long; Colombia (Río Apaporis). 26. *M. insignis.*

34. Lateral veins when dry flat or slightly elevated on the upper surface, the number often indefinite because of the numerous nearly equal intermediate veins; leaves pubescent or glabrous and smooth beneath, not bullate; buds and pubescence various.

36. Pubescence white to gray or yellowish-white; buds closed, 3.5–5 mm long.

37. Inflorescence canescent or appressed-pubescent with grayish white hairs; leaves broad, 6–9 cm long, 1.3–2.2 times as long as wide, obtuse and emarginate to blunt or rounded at the tip; calyx calyptrate, with small accessory lobes persistent on the hypanthium; Venezuela (Guayana), at elevations of 1700–2000 m. 21. *M. cana.*

37. Inflorescence velutinous to hirsute with yellowish-white hairs; leaves 8–13 cm long, 2–3 times as long as wide, narrowly acuminate; calyx opening irregularly longitudinally into about 4 lobes; Amazonian Peru and Brazil (Rio Uaupés). 36. *M. spruceana.*

36. Pubescence reddish, reddish-brown, coppery, or brownish-yellow; buds open or closed.

38. Pubescence relatively sparse, the reddish appressed dibrachiate hairs most abundant on the base of the hypanthium; flowers closely sessile along the raceme-like branches and often apparently immersed in them; buds 2.5 mm long, calyptrate; British Guiana. 2. *C. apoda.*

38. Pubescence abundant, the buds and inflorescence so densely covered that most of the surface is obscured.

39. Midvein flat or convex above, the whole sometimes sunken as the result of a troughlike folding of the blade, the vein proper 1–1.5 mm wide at the base; inflorescence velutinous with coarse lustrous antrorsely appressed reddish-brown hairs; buds obovoid, 4–4.5 mm long, appearing closed but actually with a tiny apical aperture with 4–5 dark marginal gland-like teeth; Venezuela (Neblina). 20. *M. caesariata.*

39. Midvein impressed above, the vein proper narrow, appearing as a V-shaped or U-shaped furrow less than 1 mm wide and up to 1 mm deep, the sides of the furrow sometimes folded together so as to obscure the vein; buds and pubescence various.

40. Leaves thickly impressed-puncticulate above (the glands more than 50 per square mm); buds closed, calyptrate, 3–4 mm long; pubescence of silky appressed brownish-yellow hairs up to 1.5 mm long. Suriname. 1. *C. amshoffae.*

40. Leaves sparingly and obscurely or not at all impressed-punctate above; pubescence of reddish-brown or coppery hairs.

41. Buds closed, calyptrate; petals none; eastern Colombia. 3. *C. canaliculata.*

41. At least the outer calyx-lobes distinct and separate in the bud; petals present; Venezuela (Guayana) to West Indies.

42. Bracts persistent, broadly deltoid-ovate and somewhat inclosing the bases of the subtended branchlets, up to

3–4 mm long, 2.5–3.5 mm wide; two interior calyx-lobes forming a calyptra; petals adherent to the calyptra and falling with it. 23. *M.* (*Krugia*) *ferruginea.*

42. Bracts falling at anthesis, lanceolate or ovate, 1–3 mm long, 1–1.5 mm wide; calyx with 4 free tips in the bud, splitting irregularly longitudinally. 22. *M. cuprea.*

Calyptranthes Sw. Prodr. Veg. Ind. Occ. 79. 1788.

1. **Calyptranthes amshoffae** McVaugh, sp. nov.

Arbor 8–12 m alta, ramulis paniculis alabastrisque pilis flavidis, usque ad 1.5 mm longis, dense obsitis; ramulis exalatis; foliis acuminatis 12–18 cm longis, supra crebro impresso-punctatis; nervo medio supra impresso; venis lateralibus non impressis; petiolis 9–15 mm longis; paniculis 6–14 cm longis multifloris; bracteis deciduis; alabastris clausis, calyptratis.

Tree 8–12 m high, up to 10 cm diameter, the inflorescence and young growth covered with loosely appressed sessile dibrachiate silky brownish yellow hairs up to 1.5 mm long; leaves elliptic to lance-ovate, (2.5–) 5–6.5 cm wide, (7–) 12–18 cm long, 2.6–3 times as long as wide, acuminate, rounded from below the middle to an acute base, the margins decurrent on the ventrally concave petiole 1.5–2 mm thick, (6–) 9–15 mm long; midvein deeply sulcate above, prominent beneath; lateral veins 15–20 pairs, slightly elevated both sides, not well contrasted to the numerous intermediates; marginal vein equaling the laterals, scarcely arched between them, 1.5–2 mm from the margin, sometimes with an outer smaller vein beyond it; blades dull green and thickly impressed-puncticulate above (the glands more than 50 per mm^2), paler and very sparingly dotted beneath, the lower surface somewhat persistently appressed pubescent; inflorescence usually abortive at the first node, the paired panicles 6–14 cm long, 3– (to 4–) times compound, many-flowered, the flowers mostly sessile in 3's near the tips; peduncle nearly terete, 1.5–2 mm thick, 3–6 cm long; basal bracts (one subtending each paired panicle) somewhat persistent, boat-shaped, keeled, acuminate, very sparsely pubescent or glabrous, 0.8–2 cm wide, 1.5–2.7 cm long; smaller bracts, and the bracteoles, deciduous before anthesis; buds 3–4 mm long, narrowly obovoid, rounded at the tip or obscurely apiculate; hypanthium after anthesis campanulate, 2.5 mm long, glabrous within; calyptra 2 mm in diameter; style 6 mm long, glabrous; stamens about 50, 5.5–7 mm long, the anthers 0.3–0.4 mm long; petals none; ovary bilocular, the ovules ascending, 2 in each locule; fruit not seen mature, probably globose, about 1 cm in diameter.

This species is named for Dr. G. J. H. Amshoff, author of the treatment of Myrtaceae in the *Flora of Suriname,* and of numerous other papers on the Myrtaceae of the Guianas. Miss Amshoff recognized the present species in the *Flora of Suriname* 3: 64 (1951), under the name of "*Calyptranthes* spec.", but did not provide a specific epithet. All the known collections are from the same general locality.

SURINAME: Nassau Mountains, savanna forest at km 7.4, March 11, 1949, *Lanjouw & Lindeman 2585* (U); same, March 2, km 5.8, No. *2407* (U); forest at 525 m elevation, Feb 28, 1955, *Maguire 40713* (MICH, type), *40719* (MICH).

2. **Calyptranthes apoda** McVaugh, sp. nov.

Arbor 15 m alta, paniculis et praesertim hypanthiis pilis rufis appressis, magna pro parte dibrachiatis, usque ad 0.5 mm longis, obsitis; ramis exalatis; foliis acuminatis 8–10 cm longis; nervo medio supra planiusculo, vix impresso; venis lateralibus non impressis; petiolis 8–12 mm longis; paniculis 9–12 cm longis multifloris, bracteis deciduis; floribus sessilibus, alabastris clausis 2.5 mm longis, calyptratis.

Tree 15 m high, the inflorescence conspicuously (but densely on the base of the hypanthium only) pubescent with appressed reddish mostly dibrachiate hairs to 0.5 mm long; leaves elliptic, 2–) 3.5–4.5 cm wide, 8–10 cm long, 2.5– times as long as wide, slenderly acuminate, acute at the base, the margins decurrent on the channeled petiole 2 mm thick, 8–12 mm long; midvein flat above or obscurely sulcate near base, prominent beneath; lateral veins about 15–20 pairs with numerous intermediates, inconspicuous on both sides; marginal vein about equaling the laterals, 1–1.5 mm from the margin; leaves above green and impressed-puncticulate, the lower surface paler and minutely dark-dotted; inflorescence of paired panicles 9–12 cm long, many-flowered, about 3 times compound, the branches sub-opposite or irregularly alternate, the nodes often enlarged, the peduncle 1–1.5 cm long, 2.5–3 mm wide below the lowest node; flowers closely sessile along the raceme-like panicle branches, and the base often appearing to be immersed (whence the name "*apoda*"); calyx reddish (Smith); buds 2.5 mm long, obovoid, short-apiculate; calyptra conic or domelike, nearly half the length of the bud; hypanthium in anthesis campanulate, prolonged 0.5 mm above the summit of the ovary, the distal margin soon widely flaring and recurved and the whole explanate, surrounded by the disk 1.5–2 mm wide; style reddish (Smith), 4.5 mm long, very soon deciduous; stamens about 35, 3 mm long or more; anthers 0.4 mm long; petals none; ovary bilocular, with 2 ascending ovules in each locule.

BRITISH GUIANA: Basin of Essequibo River, near mouth of Onoro Creek, lat. about 1°35′ N., dense forest on high land, Dec 15–24, 1937, *A. C. Smith 2723* (NY, type; US).

3. **Calyptranthes canaliculata** McVaugh, sp. nov.

Arbor vel frutex, usque ad 12 m altus, ramulis paniculis alabastrisque pilis lucidis rufis, magna pro parte dibrachiatis, 0.6–1.2 mm longis, dense obsitis; ramulis exalatis; foliis acuminatis 14–21 cm longis, supra vix punctatis; nervo medio supra impresso; venis lateralibus non impressis; petiolis 7–10 mm longis; paniculis 10–17 cm longis multifloris; bracteis deciduis; alabastris clausis 2 mm longis calyptratis.

Tree or shrub to 12 m high, the inflorescence and young growth heavily pubescent with appressed or spreading lustrous reddish-brown hairs 0.6–1.2 mm long, the hairs mostly dibrachiate and attached very near one end; leaves elliptic-ovate, 5.5–8 cm wide, 14–21 cm long, 2.2–2.7 times as long as wide, acuminate, rounded to the base and finally acute, the margins decurrent on the inner angles of the stout, rough, channeled petiole 2–3 mm thick, 7–10 mm long; midvein impressed above as a broad U-shaped or V-shaped channel 1 mm wide at the base and half as deep; lateral veins about 15–20 pairs in addition to some weaker intermediates, inconspicuous above, more prominent beneath; marginal vein about equaling the laterals and arched between them, 3–8 mm from the margin, with a weaker submarginal vein beyond it; leaves smooth above or sometimes obscurely dotted, the lower surface paler and abundantly and finely dark-dotted; inflorescence of paired panicles from an abortive compressed axis up to 3 mm long and wide, the individual panicles 10–17 cm long, 3 times compound, many-flowered, the flowers mostly clustered in 3's near the tips; peduncle 4–7 cm long, somewhat compressed, 1.5 mm wide at the summit; bracts and bracteoles early deciduous; buds 2 mm long, obovoid, apiculate, calyptrate, the calyptra domelike, 1.5 mm across; hypanthium in anthesis campanulate, glabrous within, prolonged at least 1 mm beyond the summit of the ovary, 1.5 mm long and 1.5 mm wide at the mouth; style 4.5–5 mm long; flowers white (Schultes & Cabrera); stamens 40–50, 4 mm long, the anthers 0.2–0.3 mm long; petals none; fruit not seen; ovary bilocular with 2 ascending ovules in each locule.

COLOMBIA: Amazonas-Vaupés: Río Apaporis, Soratama, elevation ca. 250 m, Aug 16, 1951, *Schultes & Cabrera 13578* (MICH, type; US), Aug 27, 1951, *Schultes & Cabrera 13791* (MICH).

4. **Calyptranthes fasciculata** Berg, Linnaea **27**: 31. 1855.

C. sericea Griseb. Fl. Brit. W. Ind. 233. 1860.

For description see Berg, l.c., or *Flora of Suriname* 3: 60 (1951). A recent collection from south of the Amazon is a notable extension of range. Lesser Antilles, Guianas, Brazil.

VENEZUELA: Bolívar: Gran Sabana, s of Mt. Roraima, elevation 1065 m, *Steyermark 59246* (F). BRAZIL: Pará: Ourém, Rio Guamá, *J. M. Pires & N. T. Silva 4632* (MICH).

5. **Calyptranthes florifera** McVaugh sp. nov.

Arbor mediocris, ramulis exalatis, paniculis sparse pubescentibus, alabastris glabris; foliis chartaceis ellipticis, 2.5–5.5 (–13) cm longis, circiter duplo longioribus quam latioribus, acutis vel breviacuminatis, basi acutis; nervo medio supra convexo vel planiusculo; petiolis 3 mm longis; paniculis 2–4 (–10) cm longis multifloris, ramulis tenuibus, pedunculis 3-floris 0.5 mm angustioribus; alabastris siccis pallidis, clausis, 3–3.5 mm longis calyptratis; hypanthio ad florendi tempus paulum explanato et marginibus tenuissimis, revolutis; orbe staminali glabro.

Small tree, the branchlets and inflorescence sparingly pubescent with pale or reddish erect or ascending hairs 0.2–0.3 mm long, these on the vegetative buds thickly appressed and up to 0.5 mm long, a very few slender dark dibrachiate hairs persisting on the midvein on the lower surface; leaves elliptic, 1.5–2.5 (–6) cm wide, 2.5–5.5 (–13) cm long, about 2–2.3 times as long as wide, about equally narrowed to the acute or short-acuminate apex and the acute base, the margins decurrent on the compressed petiole 1 mm wide, 3 mm long; midvein flat or convex above, scarcely more prominent beneath; lateral veins 10–15 pairs, weakly defined and separated by irregular reticulations, apparent as pale fine lines above, slightly elevated beneath; marginal veins similar, arched between the laterals, 1–2 mm from the margin; blades very smooth but dull above, paler but rougher beneath, with pale translucent dots apparent on both surfaces; inflorescence axillary and terminal, the paired panicles 2–4 (–10) cm long, reddish, twice compound, often 30- to 60-flowered, the flowers short-pedicelled near the tips of the branches, drying pale yellow-brown; peduncle 1–1.5 (–3.5) cm long, 1–1.5 mm wide near the summit; buds closed, obovoid, 3–3.5 mm long including the short apiculum and the short pseudostalk; hypanthium in anthesis infundibuliform, prolonged 1.5 mm beyond the summit of the ovary, the thin margin soon revolute and the whole explanate, the disk 2.5 mm wide; calyptra domelike, about 2 mm wide; style 3.5–4.5 mm long; stamens about 100, to 5 mm long, the anthers 0.2 mm long; petals 4, irregularly obovate or spatulate, cuneate, erose, about 1 mm wide, 2 mm long, one or more often adhering to the calyptra; ovary bilocular, with 2 ascending ovules in each locule.

VENEZUELA: Bolívar, Río Pargueni, along river 1–10 km above mouth, elevation 90 m, Dec 10, 1955, *Wurdack & Monachino 39781* (MICH), *39782* (MICH. type). BRAZIL: Amazonas, Rio Negro, Tapurucuara, between mouth of Rio Curicuriari and Barcellos, *Schultes & López 8918*, Sept-Oct 1947 (US).

The thin revolute margins of the hypanthium, on which occasionally persist small irregular lobes in addition to the calyptra, suggest the possibility that this species might be assigned to *Marlierea* instead of *Calyptranthes*. It is closely similar in morphology, however, to *Calyptranthes multiflora* Berg, a widespread species of the Upper Amazon and Orinoco Basins; the two are so much alike that they might conceivably be conspecific, and surely are congeneric. Unfortunately I have never seen flowering material of *C. multiflora* and its generic position can not be surely determined from specimens which are in bud only, or in fruit only. It would be premature to transfer it to *Marlierea* before flowering specimens have been studied.

Range of *C. multiflora* north of the Amazon:

VENEZUELA: Amazonas, márgen anegada y arboreada del caño Macasi. Capihuara, Alto Casiquiare, elevation 120 m, 4–6–42, *L. Williams 15794* (US); Brazo Casiquiare, *Holt & Blake 672*, February 1931 (NY); Esmeralda, edge of river, elevation ca. 325 ft, *Tate 308*, November 1, 1928 (NY). Bolívar; Alto Río Paragua, near mouth of Río Carapo, elevation 300 m, September 5, 1943, *Cardona 918* (F); Alto Río Paragua, Salto Guaiquinima, elevation 300 m, October 10, 1943, *Cardona 993* (F); Guaiquinima, elevation 285 m, *Killip 37499* (US). Apuré: Along Río Cinaruco above Las Galeras de Cinaruco, elevation 80–90 m, January 24, 1956, *Wurdack & Monachino 41346* (MICH).

A specimen which suggests a condition intermediate between *C. florifera* and *C. multiflora* is *Schultes & Cabrera 12642*, from Soratama, Río Apaporis, entre el río Pacoa y el río Kananarí, elevation 250 m, Amazonas-Vaupés, Colombia, 18 June 1951 (MICH). This has the broad leaves of *florifera*, and apparently the pubescence and tendency to darken of *multiflora*.

An undescribed species of unknown genus has been collected twice in fruit, and will key out near *Calyptranthes florifera*. It is described as a tree 12–15 m high; it is glabrous except the pale-hairy vegetative buds; leaves ovate, rigidly coriaceous, 2.5–4 cm wide, 5.5–10 cm long, 2–2.7 times as long as wide, gradually but prominently acuminate, rounded and subcordate or cordate at the base, on very stout and short petioles 1.5–2 mm thick, 2–3 mm long; midvein broad and flat or convex above, 1–1.5 mm wide at the base; lateral veins scarcely apparent above, the surface very smooth and featureless; margins cartilaginous, somewhat revolute when dry; paired panicles up to 5 cm long in fruit, probably twice compound and freely branched, the fruit (somewhat immature) globose with a short conical base, 1.5–2 cm in diameter, with a thick woody pericarp 3 mm thick, the whole with terminal convex disk 3–3.5 mm wide, surrounded by the narrow remains of the hypanthium tube; seed 1, myrcioid.

The paired panicles and the naked umbo at the end of the fruit suggest that this plant belongs to *Calyptranthes* or to *Marlierea*, but in the absence of flowers it seems premature to assign it definitely to a genus.

VENEZUELA: Amazonas: Caño San Miguel, Río Guainía, margen arboreada y periódicamente anegada, elevation 127 m, March 25, 1942, *Williams 14877* (F, US). COLOMBIA: Vaupés, Río Guainía basin, Río Naquieni, vicinity of Cerro Monachí, June 1948, *Schultes & López 10049* (US).

Two fruiting specimens from the middle Orinoco lowlands are referred to *C. multiflora* with some question: the leaves reach maximum dimensions of 4–7 cm wide, 12–14 cm long, and the fruits are oblate, 1–1.5 cm in diameter; leaves and fruits appear to be larger than might be expected in this species, but both specimens include some leaves of more usual dimensions for *C. multiflora*, and the general appearance is exactly of that species.

VENEZUELA: Amazonas, alto Río Orinoco, along Río Padamo 10 km above mouth, elevation 150 m, March 27, 1953, *Maguire and Wurdack 34731* (MICH); Cerro Sipapo (Paráque), forest near base camp, elevation 125 m, January 14, 1949, *Maguire and Politi 28385* (MICH).

6. **Calyptranthes lucida** DC. Prodr. 3: 258. 1828.

Tree 10–20 m high and 15–30 cm in diameter, glabrous except the vegetative buds (thickly) and the abortive axes at the bases of the panicles (sparingly) appressed-pubescent with reddish dibrachiate hairs 0.3–0.5 mm long, a few hairs sometimes persisting about the base of the panicle proper; branchlets narrowly winged as in *Calyptranthes*, the wings scarcely 0.2 mm wide; leaves elliptic-ovate, 2–4 cm wide, 5.5–10 cm long, 2.2–3 times as long as wide, about equally narrowed to the acuminate tip and the acute or cuneate base, the margins long-decurrent on the channeled petiole 1 mm thick, 4–6 mm long; midvein impressed above, prominent beneath; lateral veins closely and finely parallel, more than 25 pairs including the intermediates, slightly elevated but inconspicuous on both sides; marginal vein about equaling the laterals, somewhat arched between them, 1–1.5 mm from the margin; blades green and abundantly gland-dotted (often impressed-punctate) above, paler and pale-dotted beneath; inflorescence of paired panicles 4–7 (–9) cm long, 2–3 times compound, up to about 30-flowered, arising from the lowest node of a tangentially compressed abortive axillary axis 1.5–3 mm long and up to 2 mm wide; lowest branches of the panicle 2–3 cm long; peduncle 1.5–3 (–5) cm long, somewhat compressed, 1 mm wide at the summit; flowers mostly appearing short-pedicellate near the tips; bracts and bracteoles very soon deciduous; buds 2.5–3 mm long, obovoid, closed and obscurely apiculate, turbinate or constricted about the middle and then obtuse at the base; calyptra dome-like, 1.5–2 mm across; hypanthium in anthesis campanulate, about 2 mm high and wide, prolonged 1.5 mm beyond the summit of the ovary; style 5–7 mm long; stamens about 60, to 5 mm long, the anthers 0.3 mm long; petals none; ovary bilocular with 2 ascending ovules in each locule; fruit glandular-verrucose, globose, 7–8 mm in diameter, crowned with the persistent hypanthium-tube 2 mm wide, 1 mm high.

The description of flowering material was taken from the Tafelberg specimens collected by Maguire; description of fruit is from Tate's specimen from Duida I concur, although somewhat reluctantly, with Amshoff's opinion that the Suriname plant is conspecific with the original specimens of *C. lucida*, which came from Bahia, Brazil. Relatively few species have such a disjunct range interrupted by the Amazon River, and study of the actual type-specimen of *C. lucida* may show that this represents another species than the one considered here. Berg's full description of *C. lucida* (in Mart. Fl. Bras. 14^1: 51-52. 1857) could be applied to the Suriname plant except that he states that the buds are 2 lines (more than 4 mm) long, and that the midvein is scarcely impressed ("supra vix impresso"). Study of a photograph of Martius' specimens (F.M. Neg. 19888) suggests that the branchlets are indeed narrowly winged as in the Suriname plant, that the buds are about 3 mm long, and that the midvein is impressed to about the same extent as in the Suriname plant.

VENEZUELA: Slope of Mount Duida, at Aguita, elevation 3100 ft, 1928 29. *G. H. H. Tate 894* (NY). SURINAME: Tafelberg: base north escarpment, Aug 11, 1944, *Maguire 24300* (F, NY); Grace Falls, Arrowhead Basin, elevation 625 m, Aug 26, 1944, *Maguire 24491* (F, NY); East Ridge Creek Gorge, elevation 750 m, Aug 29, 1944, *Maguire 24542* (F, NY); base of cliffs, west escarpment, elevation 1400 feet, Sept 10, 1944, *Maguire 24691* (F, NY), *24692* (NY).

7. Calyptranthes macrophylla Berg in Mart. Fl. Bras **14:**[1] 45. 1857.

For description see Berg, l.c. Amazonian Brazil (the type from Ega on the upper Amazon) to Venezuela.

VENEZUELA: Amazonas: Capihuara, alto Río Casiquiare, elevation 118 m, *Williams 15689* (F).

8. Calyptranthes multiflora Berg in Mart. Fl. Bras **14:**[1] 42. 1857.

?C. poeppigiana Berg, l.c. 45.

Closely related to *C. florifera* McVaugh, and discussed above under that species. For description see Berg, l.c. Amazonian Brazil and Peru to eastern Colombia and southern Venezuela. Type from Ega [Teffé], Brazil. For key to the position of this species in the Peruvian flora, see Fieldiana Bot. **29:** 178 (1956).

9. Calyptranthes ovoidea McVaugh, sp. nov.

Arbor velutina, ramulis exalatis; foliis 6–8.5 cm longis ovatis vel ellipticis, acuminatis, petiolis 6–7 mm longis; nervo medio utrinque convexo; alabastris 4–5 mm longis hirsutis, anguste ovoideis, clausis, calyptratis; paniculis 3–5-floris, pedunculis 3–6 mm longis.

A tree, with young shoots, inflorescence, and petioles velutinous, the sharp lustrous somewhat flexuous pale brown hairs 1–1.5 mm long, the surface of the young leaves, buds, and inflorescence completely covered; leaves ovate or elliptic, 2.5–3.7 cm wide, 6–8.5 cm long, 2–2.5 times as long as wide, acuminate, acute at the base, the margins decurrent on the verrucose, shallowly channeled petiole 1 mm thick, 6–7 mm long; midvein convex, about equally elevated on the two surfaces; lateral veins 20–25 pairs, very slender and with numerous intermediates, scarcely apparent; marginal vein about equaling the laterals and scarcely arched between them, 0.5–1 mm from the margin; mature blades dull and nearly featureless above, finely dark-dotted beneath; inflorescence axillary, glomerate, consisting of paired reduced 3- to 5-flowered panicles in each axil; flowers sessile, the 3 central ones in a terminal cluster on a peduncle 3–6 mm long, the 2 lateral flowers, if present, at the base of the peduncle; bracts ovate or lanceolate, 1.5–2.5 mm long, deciduous at anthesis; buds narrowly ovoid, hirsute, 4–5 mm long; hypanthium at anthesis 2 mm high, glabrous within; calyptra 3 mm long, and 3 mm across the orifice, with a stout apiculum 1.5 mm long (the size and shape of the apiculum completely obscured by the covering of hairs); plants dioecious (?), the style in staminate flowers less than 1 mm long, apparently abortive; functionally pistillate flowers not seen; stamens about 100, 3.5 mm long, the anthers 0.3 mm long; petals none.

A most distinctive species, known from but a single collection in which the buds are beginning to open. The collector noted that the plants were apparently dioecious, and this seems to be confirmed by the want of a style in the staminate flowers.

BRITISH GUIANA: Wabuwak, Kanuku Mts., 2000 ft elevation, Oct 1948, *Fr. G. Wilson-Browne, S.J. 344* (*Forest Dept. 5764*) (NY, type; K; MICH).

10. Calyptranthes paniculata Ruiz & Pavón, Fl. Peruv. Prodr. 74. pl. *13.* 1794.

For description see Berg, Linnaea **27:** 20 (1855). Amazonian Peru (the type) and Brazil. Apparently the same species in:

COLOMBIA: Amazonas-Vaupés: Río Apaporis, entre el Río Pacoa y el Río Kananarí, Soratama, elevation ca. 250 m, Aug 16, 1951, *Schultes & Cabrera 13553* (US, MICH).

11. Calyptranthes pulchella DC. Prodr. **3:** 257. 1828.

A small tree, 5–12 m high, 4–8 cm in diameter, the inflorescence, young branchlets, vegetative buds, and lower leaf-surfaces more or less strigose with sessile dibrachiate rufous hairs; branchlets 2-winged, the wings arising just above the axil at one node, and terminating between the leaf-bases at the node above; leaves cuneate, obovate or broadly elliptic, mostly less than 5 cm long, usually rounded or very obtuse at the apex (sometimes acute but blunt-tipped, or broadly and shortly acuminate), acute or cuneate at the base, the margins decurrent on the stout channeled petiole 0.7–1 mm thick, 2–3 mm long; midvein flat or sulcate above, prominent beneath; lateral veins very slender and scarcely apparent, 8–12 pairs with several intermediates; marginal vein like the laterals, 0.5–1 mm from the margin; leaves dull in drying, paler beneath; inflorescence usually of slender paired 5- to 20-flowered panicles 5 cm long or less, the flowers sessile along the branchlets and at the tips, or the lower at the tips of short lateral branchlets; bracts and bracteoles deciduous; petals none.

The type of this species came from Minas Gerais, Brazil, where it was collected by Martius. Berg in 1859 described var. *parviflora,* based on a collection by Spruce from the Río Vaupés. More recently Amshoff has tentatively referred to this species two collections made by Maguire in Suriname (Fl. Surin. **3:** 63. 1951), and McVaugh has identified certain collections from Amazonian Peru as belonging to the same species (Fieldiana Bot. **29:** 178. 1956). All the above are alike in having winged branchlets, small obtuse cuneate or obovate leaves, and a short, slender, and few-flowered inflorescence. All are pubescent at least to a very slight degree with short reddish dibrachiate hairs. It is by no means certain, however, that all these plants are conspecific, and more collections for study are needed. The several plants which have been referred to *C. pulchella* may be characterized as follows:

C. pulchella var. **pulchella.**

Branchlets winged, the wings probably 0.3 mm high; leaves glabrous, 1.5–2 cm wide, 2.5–4 cm long, 2–2.5 times as long as wide, the dots on the lower surface apparently 10–15 per mm^2 (F. M. Neg. 19897); inflorescence 2.5–3.5 cm long, sparsely antrorsely strigose; buds 2.7–3.5 mm long; stamens about ?50, about 4 mm long. Type seen at M, 1954.

C. pulchella (Guianas).

Wings of branchlets 0.2–0.3 mm high; pubescence general, or mostly confined to the inflorescence (sometimes uniformly distributed in inflorescence and sparse on the lower leaf-surface, as in *Maguire 24714,* or almost wanting except at the base of the flower-bud, as in *Maguire 32295*); leaves variable in shape (from nearly elliptic to cuneate-obovate), 1–1.7 cm wide, 2–3.5 cm long, twice as long as wide, distinctly punctate above, the dots on the lower surface 6–7 per mm^2; inflorescence variable [in *Maguire 24714* 5- to 9-flowered, the peduncle 1 cm long, the lateral flowers sessile, or 1–3 on short branchlets 4–5 mm long; in *Maguire 24267, 32295* the flowers 3 (or 5), sessile or pedicellate, the peduncle 1–2.5 cm long]; style 3–4 mm long; stamens about 50; anthers 0.3 mm long.

There is much variation among the Guiana specimens which have been assigned to this species, and the distinction, if any, between these and the type of the species cannot be made. The type strongly resembles *Maguire 32295* in leaf-shape and in pubescence. It may be that more than one variety is represented in the Guianas.

SURINAME: Tafelberg, *Maguire 24267* (F, NY), *24714* (F, NY). BRITISH GUIANA: Pakaraima Mts., Upper Mazaruni R., elevation 1250 m, Kauaurieng R., *Maguire 32295* (MICH).

C. pulchella δ **parviflora** Berg in Mart. Fl. Bras. **14^1**: 516. 1859.

Glabrous (a few hairs on the vegetative buds and the nodes of the inflorescence); wings 0.2 mm high; leaves 1.5–2 cm wide, 2.5–3.5 cm long, 1.5 times as long as wide; dots on the lower surface about 50 per mm^2; inflorescence 3–4 cm long, 11- to 18-flowered; peduncle 1.5–2 cm long; buds distinctly but very shortly apiculate; anthers 0.3 mm long.

COLOMBIA-BRAZIL: Prope Panure ad Rio Uaupés, *R. Spruce 2729*, Oct 1852–Jan 1853 (Isotype, K [herb. Hook.]); In sylvis ripariis fluv. Paapuris, Oct 1852, *Spruce 2729* (Isotype, K [herb. Benth.]).

C. pulchella (Peru and Brazilian Amazonia).

Glabrous except the vegetative buds and youngest branchlets strigose; wings up to 0.5 mm high, prolonged distally into auricle-like tips 1–1.7 mm long; leaves 1.5–3.3 cm wide, 2.5–6 cm long, 1.5–2 times as long as wide, indistinctly punctate above, sparingly dotted beneath; inflorescence 3–5.5 cm long, the branches filiform or very slender, 3- to 11-flowered; peduncle 2–2.5 cm long; buds 4–7 mm long, 2–3 mm thick, rounded or obscurely apiculate, the calyptra 2–3 mm long; style 6–8 mm long; stamens about 125, 5–6 mm long; anthers 0.3 mm long; fruit globose, 8 mm in diameter, verruculose.

PERU: Loreto, Mishuyacu, *Klug 1373;* Timbuchi, *Williams 959*. BRAZIL: Amazonas, near mouth of Rio Embira, basin of Rio Juruá, *Krukoff 5059* (MICH).

12. **Calyptranthes pullei** Burret ex Amshoff, Rec. Trav. Bot. Néerl. **42:** 4. 1950.

A shrub or small tree to 8 m high, the young branchlets winged, the wing up to 0.3 mm high, terminating distally at a node between the leaf-bases; plant glabrous or essentially so, the young branchlets and the inflorescence sometimes sparsely pubescent with appressed dibrachiate sessile reddish-yellow hairs to 0.3 mm long; leaves broadly elliptic or ovate, (1.5–) 2–3.8 cm wide, (2.5–) 3–5.5 cm long, 1.4–1.8 times as long as wide, rounded or obtuse at the apex, obtuse to rounded or subcordate at the base, the margins abruptly decurrent on the petiole which is 1–2 mm thick, 1.5–2.5 mm long, dark, abruptly differentiated from the midvein on the lower surface; midvein concave at the base on the upper surface, plane near the tip, prominent beneath; lateral veins about 15 pairs, the number indefinite, with numerous intermediates approximately equal in size; marginal vein 1–2 mm from the margin, about equaling the laterals and arched between them, with a weaker submarginal vein beyond it; leaves smooth and nearly concolorous, impressed-punctate above, marked beneath with 15–25 small dark glandular dots per mm^2; inflorescence of paired panicles to 6–7 cm long, the abortive axis up to 5–9 mm long, compressed, 2 mm wide, the panicles 3 times compound, 30- to 40-flowered, the flowers mostly in 3's near the tips, the peduncle 2–4 cm long, nearly terete, about 1.5 mm thick just below the lowest node; buds 2.5–3 mm long, obovoid to nearly globose, weakly apiculate or rounded at the apex, turbinate at the base; calyptra convex, 2 mm across; open hypanthium cup-shaped, prolonged 1 mm beyond the summit of the ovary, the orifice 2 mm across; style 5–6 mm long; stamens about 150, the longest 4 mm long, the anthers 0.4 mm long; petals none; fruit not seen.

Calyptranthes pullei var. *pullei*, described above, is known from several localities in Suriname. Various specimens were cited by Amshoff (in Fl. Surin. **3:** 63.

1951). The variety also occurs in British Guiana: Caburi Falls, Paruni R., *Jenman 7624* (U); Mazaruni R., *Forest Dept. 7142* (NY, U).

In the lowlands of southern Venezuela this species is represented by the following variety, indistinguishable from the plant of British Guiana and Suriname except by the nearly featureless leaves.

Calypthranthes pullei Amshoff, var. **immaculata** McVaugh, var. nov. Var. *pullei* valde similis, sed distincta: foliis obscure obsoleteque punctatis, glandulis minutis, 8–10/mm^2.

In this variety the leaves are green above, usually without any indication of impressed glandular dots; the lower surface is paler, with no glandular dots apparent or with these pale and obscure, never dark and prominent as in var. *pullei.*

VENEZUELA: Bolívar, Alto Río Paragua: Salto Guaiquinima, elevation 265 m, April 12, 1943, *Félix Cardona 513* (US); Cerro Perro, in sandstone sabanas, *Cardona 738,* July 1943 (US); Raudal Guaiquinima, elevation 300 m, July 20, 1944, *Cardona 1083* (F; US, type); same locality and date, *Cardona 1086* (US); between Río Torono and Salto de Auraima, elevation 275 m, *Killip 37537,* April 17, 1943 (F, US). Amazonas: Orinoco R., between Tamatama and S. Fernando de Atabapo, elevation 100 m, Sept 7, 1944, *J. A. Steyermark 58422* (F, U); Río Orinoco, between mouth of Río Atabapo and mouth of Río Ventuari, elevation 150 m, Sept 6, 1954, *J. Silverio Level 124* (MICH).

13. **Calyptranthes smithii** McVaugh, sp. nov.

Arbor grandis, appresse pubescens vel velutina; paniculis petiolis ramulisque novellis, pilis rufis lucidis partim dibrachiatis 0.5–1 mm longis, obsitis; ramulis exalatis; foliis 9–12 cm longis acuminatis; petiolis 10–12 mm longis; paniculis immaturis 2 cm longis, 20-floris, conspicue bracteatis, ramulis lateralibus vix evolutis, pedunculo fere nullo; alabastris 3–3.5 mm longis, clausis, basi velutinis.

Tree 20 m high, the branchlets, inflorescence, petioles, and young growth appressed-pubescent or velutinous with reddish-brown lustrous partly dibrachiate hairs 0.5–1 mm long; leaves elliptic-ovate, coriaceous, 3.5–4.5 cm wide, 9–12 cm long, 2.6–3 times as long as wide, acuminate, acute to rounded at the base, the margins decurrent on the petiole 1.5 mm thick, 10–12 mm long; midvein flat or channeled above, prominent beneath; lateral veins fine and closely parallel, 20–25 pairs but the number indefinite because of numerous intermediates, inconspicuous on the upper surface, evident beneath; marginal vein about equaling the laterals, about 0.5 mm from the margin; leaves glabrous and lustrous above, impressed-punctate or the glands visible in the translucent surface, the veins not elevated above the surface in drying; lower surface somewhat persistently pubescent, paler, sparingly dotted; inflorescence axillary, in bud stout, the paired panicles 2 cm long, the longest internode 1 cm long, the branches coarsely bracteate, the bracts boat-shaped, persistent, 2.5 mm wide, 4 mm long, blunt-pointed; bracteoles lanceolate, 1.5 mm long; flowers about 20 in each panicle; buds 3–3.5 mm long, 2–2.5 mm thick, obovoid to subglobose, abruptly short-apiculate, thinly appressed-pubescent and at least the base persistently velutinous; calyx probably calyptrate; hypanthium glabrous within, produced 2 mm beyond the summit of the ovary; style not seen expanded; stamens about 150, 4 mm long, the anthers 0.5 mm long; petals none; functionally pistillate flowers not seen.

BRITISH GUIANA: Basin of Essequibo River, near mouth of Onoro Creek, lat. ca. 1°35′ N., dense forest, along river, Dec 15–24, 1937, *A. C. Smith 2643* (NY, type).

This species, unfortunately not known in flowering or fruiting condition, appears to be related to *C. macrophylla*, *C. speciosa*, and *C. longifolia*, all species in which the stout and congested inflorescence is somewhat persistently bracteate, and in which the dioecious condition is frequent. The present species closely resembles *C. macrophylla*, but the leaves are smaller and less abundantly pubescent beneath, the midvein is not impressed above, the pubescence of the inflorescence is more copious and of longer hairs.

14. **Calyptranthes speciosa** Sagot, Ann. Sci. Nat. Ser. VI. **20:** 187. 1885. var. **speciosa.**

For description see Amshoff, Fl. Surin. **3:** 61 (1951). In the region from eastern Colombia to northeastern Peru this species is represented by *C. speciosa* var. *gigantifolia* (McVaugh) McVaugh, comb. nov. (*C. gigantifolia* McVaugh, Fieldiana Bot. **29:** 181. 1956). Var. *speciosa* is known from relatively low-lying areas in Suriname and French Guiana, the type from the French side of the Marowijne [Maroni] River.

15. **Calyptranthes spicata** Amshoff, Rec. Trav. Bot. Néerl. **39:** 148. 1942.

Suriname; known only from the type. For description see Fl. Surin. **3:** 60 (1951).

16. **Calyptranthes spruceana** Berg in Mart. Fl. Bras. **14^1:** 45. 1857.

For description see Berg, l.c. Known only from the type-collection, *Spruce 1551*, found near the junction of the Rio Negro with the Rio Solimões.

Marlierea Camb. in St.-Hil. Fl. Bras. Merid. **2:** 373 (folio ed. 269). *pl. 156.* 1829.

17. **Marlierea bipennis** (Berg) McVaugh, comb. nov.

Myrciaria bipennis Berg, Linnaea **31:** 259. ?1862.
Myrcia bipennis (Berg) McVaugh, Fieldiana Bot. **29:** 189. 1956.

Up to 2.5–3 m high; leaves elliptic to lanceolate or ovate, 3–5 cm wide, 7–15 cm long, (2–) 2.5–3.5 times as long as wide, narrowed from the middle or below to the apex, rounded or acute at the base, the margins cuneately decurrent on the channeled petiole 1–1.5 mm thick, the petiole keeled or angled on the back at least in young leaves; midvein impressed as a narrow closed furrow; marginal vein 1 (–2) mm from the margin; upper leaf-surface obscurely puncticulate or the glands scarcely apparent; paired panicles up to 3 cm long, 5- to 9-flowered; flowers not seen; stamens probably 75–100; fruit 8–10 mm in diameter, lustrous blue-black.

BRAZIL: on the Rio Negro, *Spruce 3770*, type. Amazonas: Cachoeira Caranguejo Rio Cauabury, *E. G. Holt & E. R. Blake 551*, Dec 16, 1930 (NY); Ilha de Jerusalem, Rio Negro, near mouth of Rio Cauabury, *Holt & Blake 556*, Dec 18, 1930 (NY). VENEZUELA: Amazonas: Solano, Bajo Casiquiare, elevation 100 m, March 12, 1942, *L. Williams 14763* (F).

This species is here designated as the type of the following distinctive section; the other members of this section are *M. guildingiana*, *M. karuaiensis*, and *M. maguirei*, which are described below in their proper alphabetical sequence. The descriptions provided for these species, and for *M. bipennis*, are abridged because a full description of the section is provided.

Marlierea sect. **Myrcioides** McVaugh, sect. nov.

Frutices vel arbores parvae, ramulis junioribus bialatis vel bicarinatis; foliis demum glabris, supra plerumque impresso-punctatis; paniculis geminatis, paucifloris, plerumque glabris; calycis lobis in alabastro parvis, in fructu inter se disjunctis, hypanthio longitudinaliter usque ad staminum orbis marginem rumpenti.

Shrubs or small trees, glabrous, or the vegetative buds densely pubescent, the inflorescence, lower surface of young leaves, and young shoots thinly pubescent, with appressed bright rufous partly dibrachiate hairs up to 0.5 mm long; flower-buds, and upper leaf-surfaces, glabrous; young branchlets angled to winged, the wing or angle originating just above and between axillary buds at a node and extending distally to the median line of the base of the petiole at the node above; petiole sometimes keeled or angled dorsally and this keel or angle continuous with the distal portion of the wing of the branchlet; branchlets often flattened into one plane by the suppression of longitudinal growth in alternate internodes and the abortion of leaves and axillary buds at the distal end of these internodes; leaves relatively coriaceous, with short stout petioles, the midvein impressed above and very prominent beneath; lateral veins very slender and closely parallel, inconspicuous on both surfaces, indefinite in number (more than 20 pairs, with numerous intermediates which are scarcely smaller); marginal vein about equaling the laterals, scarcely arched between them, 2 mm or less from margin; blades above dark green, lustrous and smooth, and often impressed-puncticulate; lower surface paler and usually finely dark-dotted; inflorescence terminal or axillary, much shorter than the leaves, marlieroid, consisting of 1–3 pairs of small fascicled panicles arising from the lowest nodes of an undeveloped and abortive central axis; paired panicles slender (the peduncle compressed or terete, up to 1.5 mm wide just below the lowest node, usually 0.6–1 mm wide), 2–6 (–8) cm long, few-flowered, the flowers solitary or in 3's near the tips of the ultimate branchlets; peduncle usually one-third to one-half as long as the panicle, and nearly or quite as long as the lowest panicle-branches; bracts and bracteoles minute, deciduous before anthesis; buds 2–3 mm long, narrowly turbinate, nearly closed, the 4 (rarely 5) free tips of the calyx 0.5 mm long, infolded over the apex until anthesis; hypanthium in anthesis splitting between the bases of the calyx-lobes as far as the revolute margin of the staminal ring, the lobes in anthesis and in fruit persistent, spreading (appressed to the fruit), somewhat irregularly margined, ovate to rounded or bluntly triangular, 1–1.5 mm long and wide, somewhat separated at the base at least in fruit; ovary bilocular, the ovules 2 in each locule, collateral, ascending; fruit glandular-verrucose, when mature dark purple or black, fleshy, globose or oblate, crowned by the persistent parallel-sided neck of the hypanthium which is 1.5–2.5 mm across and about 1 mm high; seeds myrcioid, 1 or 2.

This very well-marked section is a perplexing intermediate which might almost as well be assigned to *Myrcia* as to *Marlierea*. The fruiting calyx and hypanthium are strongly suggestive of those of various species of *Myrcia* (*Aulomyrcia*). The flower buds, however, are similar to those of other species of *Marlierea*, and split longitudinally between the bases of the calyx-lobes, as usual in that genus. The inflorescence is usually abortive at the lowest node; this is frequent in *Marlierea* and *Calyptranthes*, but very rare in undoubted species of *Myrcia*. The partly dibrachiate hairs of the young branchlets are characteristic of *Calyptranthes* and may be found in *Marlierea*, but are rare in *Myrcia*. The petals in *M. guildingiana* are 4 in number, and inserted about the margin of the staminal ring at regular intervals, but they do not alternate with the calyx-lobes in a regular manner, as might be expected; instead the petals are inserted without any apparent relation to the supposed calyx-lobes—in one flower one petal may be opposite the middle of a calyx-lobe, the next near one margin or another of an adjoining lobe, and a third in the interval between two calyx-lobes. This lack of symmetry suggests the possibility that the structures which are apparently calyx-lobes are not in actuality members of a true floral whorl, but have resulted merely from the random splitting of the hypanthium. If this be true it represents additional confirmation for the assignment of this species to *Marlierea* rather than to *Myrcia*. Evidence as a whole seems to point to such a disposition of the four taxa assigned to this section.

Specific lines are not clearly drawn in this section. Mr. N. Y. Sandwith observed some years ago that *M. guildingiana* is scarcely to be separated from *M. bipennis* except by the strongly winged branchlets in the latter, and the weak development of wings in the former. Additional materials from intermediate stations in northern Brazil and southern Venezuela may serve to clarify the status of the several taxa. At present they may be regarded as distinct and distinguishable species. They are geographically isolated from one another as far as known, and although the morphological differences between them are trivial they are constant as far as one can tell.

18. Marlierea biptera Amshoff, Rec. Trav. Bot. Néerl. **42:** 3. 1950.

For description see Amshoff, l.c., or Fl. Surin. **3:** 68 (1951). Known only from the type, collected in eastern Surinam. The branchlets are winged as in sect. *Myrciopsis*, but the relatively abundant pubescence, the coarse and many-flowered panicles, the large buds (probably 5 mm long) and the dehiscent calyx indicate that *M. biptera* is not closely related to the species of this section.

19. Marlierea buxifolia Amshoff, Bull. Torrey Club **75:** 529. 1948.

For description see Amshoff, l.c. Known only from British Guiana, the type from the Kaietur Savanna.

20. Marlierea caesariata McVaugh, sp. nov.

Arbor 12 m alta, velutina, paniculis ramulisque novellis, pilis rufis appressis lucidis simplicibus, 0.5 mm longis obtectis; ramulis exalatis; foliis 10–21 cm longis, acuminatis; nervo medio supra planiusculo vel convexo; venis non impressis; petiolis 10–20 mm longis; paniculis circiter 20-floris, in alabastro 4–6 cm longis; bracteis ut videtur deciduis; alabastris 4–4.5 mm longis non omnino clausis.

Tree to 12 m high, the inflorescence and young growth velutinous, very thickly covered with coarse, lustrous, antrorsely curved and appressed, unbranched pointed reddish-brown hairs 0.5 mm long (*caesariata*, having a beautiful head of hair); leaves elliptic, (3.5–) 6–10 cm wide, (10–) 15–21 cm long, 2–3 times as long as wide, about equally narrowed to the abruptly acuminate tip and the acute base where somewhat trough-shaped; margins long-decurrent on the petiole 1.5–2 mm thick, 10–20 mm long; midvein flat or convex above, the whole sometimes impressed, prominent beneath; lateral veins 15–20 or more pairs, including some intermediates, slightly elevated on both sides, more prominent beneath; marginal vein about equaling the laterals, somewhat arched between them, 1–2 mm from margin; blades lustrous above, paler beneath, obscurely dotted on both surfaces; inflorescence axillary and terminal, the panicles in bud 4–6 cm long, twice compound, about 20-flowered, the flowers clustered near the tips; peduncle 2–3.5 cm long, compressed, 2–3 mm wide near summit; bracts 4 mm long, lanceolate, attenuate; bracteoles similar, lance-linear, 3 mm long; buds 4–4.5 mm long, obovoid, appearing obscurely apiculate because of the position of the hairs at the tip, but actually rounded at the apex, nearly closed, the tiny apical aperture with 4 or 5 dark marginal gland-like teeth; calyx glabrous within, apparently opening by irregular longitudinal breaks; hypanthium prolonged 1.5 mm beyond the summit of the ovary, glabrous within except the hairy staminal ring; stamens 150 or more, the anthers 0.4 mm long; petals 4 or 5, fleshy, spatulate or subrotund, silky on the outer surface, 1–2.5 mm long, 1.5–2 mm wide; ovary bilocular, with two ascending ovules in each locule.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, forests on middle slopes, elevation 650–700 m, Dec 23, 1953, *Maguire et al. 36820* (MICH, type).

21. **Marlierea cana** McVaugh, sp. nov.

Arbor, vel frutex 2 m altus, appresse pubescens vel canescens, paniculis ramulisque novellis pilis incanis, usque ad 0.5 mm longis obsitis; ramulis exalatis; foliis 6–9 cm. longis, obtusis; nervo medio supra convexo; venis non impressis; petiolis 3–7 mm longis; paniculis 5–9 cm longis, 20–30-floris, elongatis (non ut in *Marlierea* geminatis), e nodis mediis (verosimiliter bracteatis) rami foliacei oriundis; bracteis deciduis; alabastris clausis, 3.5–4.5 mm longis; calyce ad anthesin circumscisso, hypanthii margine revoluto, lobos inaequales parvos gerenti.

Tree, or shrub 2 m high, the young growth and inflorescence (especially the hypanthium) appressed-pubescent or canescent with grayish-white hairs up to 0.5 mm long; leaves coriaceous, elliptic or ovate, (2.8–) 3.5–6 cm wide, 6–9 cm long, 1.3–2.2 times as long as wide, blunt-pointed, obtuse and emarginate, or rounded at the tip, obtuse to rounded or subtruncate at the base, the margins abruptly decurrent on the petiole 1.5–2 mm thick, 3–7 mm long; midvein convex or flattened above, narrowly channeled near the base, prominently convex beneath; lateral veins 10–15 pairs, inconspicuous, raised a little on both sides when dry; marginal vein about equaling the laterals and slightly arched between them, 1–2 mm from the margin; blades smooth and lustrous above, paler beneath, finely dark-dotted on both sides when young, at maturity obscurely impressed-punctate above and very finely dotted beneath; inflorescence a myrcioid panicle, 5–9 cm long, 3 times compound, 20- to 30-flowered, borne at one of the middle (probably bracteate) nodes of a leafy shoot; peduncle 2.5–4.5 cm long, compressed, 2–2.5 mm wide just below the first node, the basal branches of the panicle 2–4 cm long, the flowers clustered near the tips of the branches; buds closed, 3.5–4.5 mm long, obovoid, bluntly and shortly apiculate; calyx calyptrate, with small irregular accessory lobes persistent on the margin of the hypanthium, the calyptra silky within; hypanthium after dehiscence campanulate, or attenuate at the base, 2.5–3 mm long, the orifice about 3 mm in diameter, the thin margins abruptly revolute, with small irregular lobes, at least the base of the tube persistently canescent; style 4–6 mm long; stamens about 125, 4.5 mm long, the anthers 0.2–0.3 mm long; petals 1 or 2, oblong to suborbicular, hirsute on the outer surface, somewhat adherent to the calyptra at the base, 1–2 mm wide, 1.5–2 mm long; ovary bilocular, with 2 ascending ovules in each locule; immature fruit globose to oblate, "turning red brown" (Cowan and Wurdack), 4–6 mm in diameter.

VENEZUELA: Amazonas: Cerro Duida, Río Cunucunuma, forested ridge west of Caño Culebra, elevation 1700–1800 m, Nov 22, 1950, *Maguire et al. 29653* (MICH, type); Río Ventuari, Serranía Parú, Río Parú, Caño Asisa, elevation 2000 m., Feb 10, 1951, *Cowan & Wurdack 31386* (MICH), Feb 4, 1951, *31227* (NY).

The generic position of this species may be questioned; the calyx is definitely calyptrate as in *Calyptranthes*, but the calyptra breaks off somewhat irregularly and the thin recurved margin of the hypanthium bears small irregular lobes as in *Marlierea.*

Of the collections cited above, the type is considerably less pubescent than the other two, and its leaves are relatively broader, and somewhat less firmly coriaceous. The differences between these plants, in my opinion, are not greater than those which might be found in ecotypes of the same species.

22. **Marlierea cuprea** Amshoff, Bull. Torrey Club **75**: 530. 1948.

For description see Amshoff, l.c. Known only from British Guiana (Essequibo and Mazaruni Rivers).

23. **Marlierea ferruginea** (Poir.) McVaugh, comb. nov.

Eugenia ferruginea Poir. in Lam. Encyc. Suppl. **3**: 124. 1813.
Krugia ferruginea (Poir.) Urb. Bot. Jahrb. **19**: 604. 1895.

For description see Urban, l.c., or Amshoff, Fl. Surin. **3**: 68 (1951). St. Vincent and Trinidad to the Guianas, the type perhaps from French Guiana or the Antilles.

VENEZUELA: Amazonas: Cerro Sipapo (Paráque), elevation 600–900 m, montane forest, Dec 1–3, 1948, *Maguire & Politi 27487* (MICH). Bolívar: Ptari-tepuí, elevation 1220 m, dense forest, Nov 27, 1944, *Steyermark 60625* (F, NY).

There seems to be little justification for the maintenance of the monotypic genus *Krugia.* The only character of the genus resides in the corolla, in which the petals are adherent to the calyptra and break free from the flower with it. Petals are weakly adherent to the calyptriform segment of the calyx in most if not all the species of *Marlierea* that have a calyx opening in this way, and one or more petals may fall with the calyptra and remain attached to it. The degree of coherence among the petals is unusually great in *M. ferruginea,* but this is hardly sufficient to serve as a generic distinction. In other respects, including the morphology of the inflorescence, this is a typical *Marlierea* except that the hypanthium does not split deeply as the fruit develops, but remains nearly entire and tubular. The calyx in *M. ferruginea,* with its 2 interior and 2 or 3 exterior lobes, is suggestive of that in the newly described *M. summa.* This species is rather readily recognized, even in fruit, by the combination of abundant rufous pubescence and persistent broadly deltoid-ovate bracts (3–4 mm long) in the inflorescence.

24. **Marlierea gleasoni** McVaugh, sp. nov.

Arbor 9 m alta, gemmis ramulisque novellis strigosis vel hirsutis, pilis crassis sordidis usque ad 1 mm longis obsitis; corolla calyceque intus creberrime pilis minusculis conicis obtectis; ramulis exalatis; foliis 9–12.5 cm longis, 2.5-plo longioribus quam latioribus, acuminatis; nervo medio impresso; venis utroque latere 8–10; petiolis 7–10 mm longis, basin versus rimosis; paniculis 4–10 cm longis, puberulis, inaequaliter ramosis, ramulis lateralibus brevibus, bracteis mox deciduis; alabastris 2.5–3.5 mm longis extus glabris, lobis distinctis.

''Slender tree, 30 feet'' (Gleason), the vegetative buds and youngest branchlets strigose to hirsute with coarse sordid acute mostly simple hairs to 1 mm long; midvein on lower leaf-surface at first closely appressed-strigose with similar, evanescent, hairs 1–1.5 mm long; inflorescence puberulent with pale straight or crisped hairs which are markedly shorter and fewer than those of the axillary shoots from which the panicles arise; petals and calyx-lobes thickly and uniformly pubescent within with minuscule erect broad-based hairs; leaves elliptic-obovate, 3.5–5 cm wide, 9–12.5 cm long, mostly 2.5–2.7 times as long as wide.

abruptly acuminate, gradually narrowed toward the base from above or near the middle, the margins at the very base acutely narrowed and decurrent on the thin ventral edges of the deeply channeled petiole 1–2 mm thick, 7–10 mm long; distal portion of the petiole slender, smooth, the proximal portion pale, corky-thickened and rimose; midvein impressed above, prominent beneath; lateral veins 8–10 pairs, somewhat impressed above; marginal vein weaker than the laterals, slightly impressed above or scarcely apparent there, consisting of a series of bold asymmetric loops between the laterals, 2.5–5 mm from the margin; blades drying with minute surface irregularities, nearly featureless above, the lower surface minutely siliceo-verruculose with inconspicuous dark dots; panicles arising laterally from the 2 or 3 lowest nodes of new hirsute terminal or axillary branchlets, which if axillary are mostly 1–3 cm long, 1–2 mm wide, with terminal bud abortive; terminal branchlets sometimes leafy beyond the inflorescence; panicles 4–10 cm long, 8–12-flowered, once or twice compound, with elliptic subtending bract 2 mm wide, 6 mm long; peduncle 2–3 cm long, 1.5–2 mm wide below the lowest node; flowers clustered near the tips of the branchlets; bracts and bracteoles early deciduous; buds glabrous, obovoid, 2.5–3.5 mm long including a short pseudostalk; calyx-lobes very unequal, the two outer erect, narrow, sometimes linear or lanceolate, 1 mm long; 3 inner lobes broadly rounded, imbricate, usually much wider than long, 1–1.5 mm long, 1.5–2 mm wide; hypanthium glabrous, broadly campanulate, after anthesis explanate, with prominent large glandular dots on both surfaces, the splits between the calyx-lobes extending toward the middle through the staminal ring and leaving entire the central area 2–2.5 mm wide; lobes irregularly oblong or quadrangular, usually 5, to 2 mm wide, 1.5–2.5 mm long; style 4 mm long; stamens 60–75, 2.5–3 mm long, the anthers 0.4–0.5 mm long; petals 5, very unequal, early deciduous, ciliate, up to 2.5 mm long; ovary bilocular, with 2 ascending ovules in each locule.

BRITISH GUIANA: Tumatumari, dense upland forest, June 18–July 8, 1921, *H. A. Gleason 171* (NY, type; K, US), *170* (K, NY, US).

25. Marlierea guildingiana (Griseb.) Krug & Urban in Urban, Bot. Jahrb. **19:** 591. 1895.

Psidium guildingianum Griseb. Fl. Brit. W. Ind. 242. 1860.

Up to 6 m high; leaves elliptic or lanceolate, 2.5–6 cm wide, 7.5–22 cm long, about 3 times (2.3–4) as long as wide, the base rounded or acute, the margins somewhat produced above the base and then abruptly decurrent on the deeply channeled or somewhat margined petiole 1.5–2.5 mm thick; petiole often verrucose and in age often transversely rimose; midvein impressed as a broad V-shaped open trough; marginal vein 1–2 mm from the margin; upper leaf-surface obscurely puncticulate, or the glands scarcely apparent; inflorescence bright reddish-crimson (Sandwith), the 1–3 pairs of panicles 2–6 (–8) cm long, each panicle 10–15 (–25)-flowered; hypanthium in anthesis campanulate, prolonged 1.5–3 mm beyond the summit of the ovary, the orifice 1.5–2.3 mm wide; style 4–5 mm long; petals 4 white with a pinkish tinge (Sandwith), suborbicular, 2.5–3.5 mm long and wide; stamens about 50, the longest 3.5 mm long, the anthers 0.5 mm long; fruit 5–9 mm long, 7–12 mm wide.

St. Vincent, Trinidad, and British Guiana, the type from St. Vincent. This species is a member of sect. *Myrciopsis*, q.v. above under *M. bipennis*.

26. Marlierea insignis McVaugh, Fieldiana Bot. **29:** 176. 1956.

For description see McVaugh, l.c. Known only from the type and paratype, from eastern Colombia (Soratama, Río Apaporis, Amazonas–Vaupés).

27. Marlierea intonsa McVaugh, sp. nov.

Arbor 12 m alta, pubescens usque ad velutina, fructu velutino; ramulis exalatis; foliis rigide coriaceis, 14–15 cm longis, 5–7 cm latis, saltem duplo longioribus quam latioribus, subtus minute bullatis, acuminatis; nervo medio supra impresso; venis apertis, impressis, utroque latere 15–20; nervo marginali 1.5–2.5 mm a margine remoto; petiolis 2 cm longis; paniculis 9 cm longis; paniculae ramulis accensis nullis.

Tree 12 m high, the inflorescence, branchlets, and lower leaf-surfaces appressed-pubescent to velutinous with pale brown straight hairs 0.5–1 mm long; fruit heavily velutinous with similar, brownish-yellow hairs; leaves rigidly coriaceous, elliptic or ovate, 5–7 cm wide, 14–15 cm long, 2–2.7 times as long as wide; abruptly short-acuminate, the base rounded, then cuneately decurrent on the deeply channeled petiole 2.5–3.5 mm thick, 2 cm long; midvein impressed above, elevated its own diameter beneath; lateral veins 15–20 pairs, stronger than the intermediates, narrowly impressed above, prominent beneath; marginal vein about equaling the laterals and markedly arched between them (at least near the tip of the blade), 1.5–2.5 mm from the margin; leaves glossy above, featureless or obscurely impressed-punctate; lower surface very finely bullate, without apparent glands; panicles axillary, myrcioid or marlieroid (then the axillary axis 2.5 cm long, abortive above the first node from which the paired panicles arise), 9 cm long, twice compound, 10–12-flowered, the flowers clustered near the tips; peduncle 4–5 cm long, compressed, 2–2.5 mm wide at the summit; buds and flowers not seen; staminal ring heavily velutinous with pale straight hairs 0.7–1 mm long; fruit globose or somewhat elongate, 2–2.3 cm in diameter, "brownish yellow green" (Steyermark); calyx subpersistent, its lobes 5, suborbicular or broadly rounded, 3 mm long, 3–3.5 mm wide, pale tomentose within (greenish, according to Steyermark), the disk in fruit obscurely pentagonal, 5–6 mm wide, densely pale-tomentose, the center depressed about 1 mm; seed 1, myrcioid.

VENEZUELA: Bolívar; Chimantá Massif, west-facing portion of Chimantá-tepuí, elevation 1600–1700 m, June 5, 1953, *J. A. Steyermark 75670* (MICH, type).

28. Marlierea karuaiensis (Steyermark) McVaugh, comb. nov.

Aulomyrcia karuaiensis Steyermark, Fieldiana Bot. **28:** 1005. 1957.

Shrub, or tree to 8 m high; leaves coriaceous, elliptic, 1.5–2.5 cm wide, 4–5.5 cm long, 2.3–3 times as long as wide, about equally narrowed to the obtuse apex and the acute base, the margins decurrent on a ventrally sulcate petiolar base 1.5 mm thick; midvein impressed as a broad V-shaped trough; marginal vein 0.5–1 mm from the margin; margins revolute; upper surface nearly featureless or somewhat impressed-puncticulate; inflorescence of paired panicles 2–2.5 cm long, 5–9-flowered; buds narrowly obovoid, 3 mm long; hypanthium in anthesis campanulate, about 2 mm long and 2 mm wide at the mouth, the thin margin and lobes reflexed; style 3–3.5 mm long; calyx-lobes 4, erect, cucullate and closed over the immature bud and somewhat thickened on the backs near apex, in unequal pairs, the outer rounded, 0.5 mm long and wide, the inner 0.5 mm long, 1 mm wide; petals 4, irregularly margined, rotund or broader than long, 1–1.3 mm long, 1.3–1.5 mm wide; stamens 50–60, 2–3 mm long; anthers about 0.3 mm long; fruit [probably immature] pale green (Steyermark), about 5 mm in diameter.

VENEZUELA: Bolívar: by waterfall, Salto de Iraba-naima, along Río Karuai, at southwestern base of Ptari-tepuí, elevation 1220 m, Nov 28, 1944, *Steyermark 60702* (F, type); Chimantá massif, ''common shrub'' at rapids of Río Apácara on igneous rock, western side of Apácara-tepuí, elevation 415 m, March 29, 1953, *Steyermark 74689* (F).

The affinities of this plant are clearly with the other species of *Marlierea* sect. *Myrciopsis,* and not with the majority of species usually assigned to *Aulomyrcia.* As pointed out above, however, in the discussion under *M. bipennis,* the line between *Myrcia* (in the inclusive sense) and *Marlierea* is not to be drawn here without some difficulty. The present species has the inflorescence of *Marlierea* and the wings on the branchlets (not noted by Steyermark in the original description) are typically marlieroid. The measurements given by Steyermark for the calyx-lobes are apparently taken from the buds at post-anthesis, after the splitting of the hypanthium.

29. **Marlierea ligustrina** McVaugh, sp. nov.

Arbor parva, glabra (petalis gemmisque exceptis); gemmis sericeis, pilis albis obsitis; ramulis exalatis; foliis rigide coriaceis, apice obtusis, ad basin acutis vel rotundatis, 4–7 cm longis, ellipticis vel ovatis; petiolis 3–5 mm longis; paniculis 4–7 cm longis, 30–35-floris, validis, pedunculis 3-floris, 0.7–0.8 mm latis; alabastris glabris, clausis, 3 mm longis; calyce in lobos inaequales dirumpenti, lobo maximo concavo, calyptratim deciduo; hypanthii margine tenuissimo, revoluto; staminum orbe glabro.

Small tree to 10 m high, glabrous except the petals and the vegetative buds, the latter silky with appressed white or at first pale reddish hairs up to 0.5 mm long; leaves rigidly coriaceous, elliptic or ovate, (2–) 3–4.5 cm wide, (4–) 5–7 cm long, (1.5–) 2–2.3 times as long as wide, obtusely pointed or obscurely acuminate, acute or sometimes rounded at the base, the margins decurrent on the channeled petiole 1.5–2 mm thick, 3–5 mm long; midvein flat or convex above (channeled shallowly near the base in some of the largest leaves), more prominent beneath especially near the base; lateral veins about 10 pairs, the number indefinite because of branching and intermediate veins, all inconspicuous above, readily apparent beneath; marginal vein about equaling the laterals and somewhat arched between them, 1–2 mm from the margin; blade smooth and lustrous above, dull and not so smooth beneath, gland-dotted both sides but more noticeably so beneath; inflorescence axillary and terminal, the axillary paired panicles 4–7 cm long, 3 times compound, thickly beset with small convex glands, 30–35-flowered, the flowers mostly in 3's near the tips; peduncle 3–4 cm long, compressed, 1.5–2 mm wide just below the lowest node; bracts subtending panicles (on the terminal shoots) ovate, scarious, to 2 mm long, deciduous; bracteoles linear-lanceolate, attenuate, scarious, glabrous, 1 mm long, deciduous when the buds are very small; buds 3 mm long, obovoid or when young cylindric, completely closed, the apex rounded, apiculate; calyx opening somewhat irregularly into several lobes, the largest of these concave, calyptra-like, 1.5 mm wide, including the apiculum and comprising the major part of the calyx; smaller lobes ovate or triangular, much smaller than the calyptra and soon reflexed with the thin margin of the hypanthium; hypanthium in anthesis broadly campanulate, prolonged 1–1.5 mm beyond the summit of the ovary, the margins very thin and abruptly revolute, the disk 2–2.5 mm wide; style about 4 mm long; stamens about 100, as long as the style, the anthers 0.3 mm long; petals 2, 2 mm long, spatulate, silky on the outer surface, sometimes with additional petal-like staminodia; ovary bilocular, with 2 ascending ovules in each locule.

VENEZUELA: Amazonas: Cerro Huachamacari, Río Cunucunuma, scrub forest near summit camp, 1800 m elevation, Dec 10, 1950, *Maguire et al. 30105* (MICH); same location, right fork of Caño de Dios above Summit Camp, elevation 1800 m, Dec 13, 1950, *Maguire et al. 30182* (MICH); Cerro Yapacana, Río Orinoco, occasional in cumbre, elevation 1200 m, Jan 3, 1951, *Maguire et al. 30738* (MICH, type).

This species is superficially very like *M. montana*, of the Guianas; it differs from that species, however, in the relatively narrower leaves which are narrower at the base, in the somewhat stouter inflorescence with shorter pedicels, and in the somewhat smaller flowers. Perhaps the most distinctive features of *M. ligustrina* are in the hypanthium and calyx; the calyx is more nearly like that of the genus *Calyptranthes*, with one large calyptra-like lobe and one or more small lobes, whereas in *M. montana* the calyx divides irregularly into lobes of more nearly equal size; the staminal ring is glabrous in *M. ligustrina*, but rather coarsely bristly in *M. montana;* the margin of the hypanthium is thin and revolute, with reflexed calyx-lobes, in *M. ligustrina*, but in *M. montana* the hypanthium and lobes are uniformly thick and tough with no apparent tendency to become reflexed.

In the following recent collection from British Guiana the flowers have the tough irregularly dehiscent calyx and bristly staminal ring of *M. montana*, but the plants are otherwise indistinguishable from *M. ligustrina*.

BRITISH GUIANA: Pakaraima Mountains, Imbaimadai Savannas, Upper Mazaruni River, elevation 550 m, Oct 22, 1951, *Maguire and Fanshawe 32179* (MICH).

30. Marlierea macrophylla Amshoff, Rec. Trav. Bot. Néerl. **42:** 2. 1950.

For description see Amshoff, l.c. Known only from British Guiana.

31. Marlierea maguirei McVaugh, sp. nov.

Frutex 1–3 m altus, pubescens, ramulis alatis, foliis lanceolatis vel anguste ellipticis 2.5–6 cm longis, 4–9-plo longioribus quam latioribus, petiolis 1–2 mm longis; nervo medio impresso; foliis supra impresso-punctatis; paniculis axillaribus binis, e nodis infimis rhachis abortivae lateraliter oriundis; fructu subgloboso, hypanthio calyceque coronato; calycis lobis 4, ovatis, obtusis, 1–1.5 mm longis, maturitate inter se disjunctis.

Shrub 1–3 m high, with pubescence of the sect. *Myrciopsis;* wings of the branchlets up to 0.5 mm high; leaves lanceolate or narrowly elliptic, 3–16 mm wide, 2.5–6 cm long, 4–9 times as long as wide, attenuate, or bluntly acuminate, narrowed from below the middle to just above the base, where abruptly contracted and the margins decurrent on the channeled petiole 1–2 mm long; marginal vein 0.3–0.8 mm from the margin; axillary paired panicles 1.5–4 cm long, with up to 15 flowers each (usually 3–5); buds and flowers not seen; fruit orange (Maguire), 6–8 mm in diameter.

VENEZUELA: Amazonas: Cerro Yutaje, Río Manapiare, stream bed among boulders, right branch of Caño Yutaje, 1400 m elevation, Feb 9, 1953, *B. & C. K. Maguire 35114* (MICH, type); same locality, elevation 1500 m, Feb 21, 1953, *Maguire & Maguire 35353* (MICH).

Distinguished from *M. karuaiensis* only by the much narrower and lanceolate rather than elliptic leaves, and by the presence of pubescence. Both species are to be assigned without question to sect. *Myrciopsis*, q.v. above under *M. bipennis*.

32. Marlierea montana (Aubl.) Amshoff, Rec. Trav. Bot. Néerl. **39:** 147. 1942.

Eugenia montana Aubl. Pl. Guiane Fr. **1:** 495. *pl. 195.* 1775.

For description see Amshoff, Fl. Surin. **3:** 66 (1951), or Berg, Linnaea **27:** 15–17 (1855) [as *M. obtusa* (Benth.) Berg, or *M. suffruticosa* Berg]. Type from French Guiana, but apparently rarely collected there; frequent in Suriname and British Guiana. Various collections from the Tafelberg are cited by Amshoff in Bull. Torrey Club **75:** 530. (1948).

33. **Marlierea multiglomerata** Amshoff, Rec. Trav. Bot. Néerl. **42:** 3. 1950.

For description see Amshoff, l.c. or Fl. Surin. **3:** 67 (1951). Along the Marowijne [Maroni] River, in Suriname and French Guiana.

34. **Marlierea salticola** Amshoff, Bull. Torrey Club **75:** 529. 1948.

For description see Amshoff, l.c. Potaro River gorge, British Guiana. The bud of this species opens by the abscission of a broad calyptra comprising the distal third of the bud, exactly as in the genus *Calyptranthes.* Apparently Miss Amshoff assigned the species to *Marlierea* because of the flaring, recurved, and ultimately fraying margin of the hypanthium; the irregular "lobes" resulting from this, however, are not a part of the calyx as they are in species having the bud opening by splits downward from the apex. Study of the flowers of this plant makes evident the weakness of the distinction between *Marlierea* and *Calyptranthes;* if the genera are to be separated (as in the past) on the basis of calyptrate or non-calyptrate buds, then this species is a *Calyptranthes;* if, on the other hand, primary emphasis is to be placed upon the splitting of the hypanthium tube below the calyx proper, then this species is properly referred to *Marlierea.*

35. **Marlierea schomburgkiana** Berg, Linnaea **29:** 209. 1858.

For description see Berg, l.c., or Amshoff, Fl. Surin. **3:** 65 (1951). Suriname and British Guiana, mostly at low elevations, the type presumably from British Guiana.

36. **Marlierea spruceana** Berg in Mart. Fl. Bras. **14**^{1}**:** 34. 1857.

M. spruceana α latifolia Berg, l.c. 515. 1859.
M. spruceana β angustifolia Berg, l.c.
M. uaupensis Berg, l.c. 516.

For description see Berg, l.c. Amazonian Peru and Brazil to eastern Colombia and southern Venezuela. Most of the known localities are from within the limits of the Guayana crystalline shield.

BRAZIL: along the Rio Negro between Barra and Barcellos, *Spruce 1505,* type, and type of *α latifolia.* COLOMBIA: Panure, Río Vaupés, *Spruce 2857,* type of *β angustifolia.* Panure, *Spruce 2839,* type of *M. uaupensis.* VENEZUELA: Amazonas: Capihuara, alto Río Casiquiare, elevation 118 m, *Williams 15786* (F). Cerro Yapacana, between Caño Yapacana and base of mountain, elevation 150 m, *Maguire et al. 30762* (MICH).

37. **Marlierea suborbicularis** McVaugh, sp. nov.

Frutex usque ad 2 m altus, subglaber, paniculis glabris; ramulis exalatis; foliis subsessilibus, 2–5 cm longis, orbiculatis vel late ovatis, basi late cordatis; paniculis circiter 50-floris, pedunculis 3-floris brevibus (plerumque 4–7 mm longis) et crassis (1–1.3 mm crassis); alabastris 3–3.5 mm longis, obovoideo-rotundatis, clausis, calyptratis; hypanthio ut videtur carnoso, in sicco rugoso, coriaceo, ei margine (calyptra delapsa) inaequaliter 5–8-lobulato, nec tenui nec revoluto; orbe staminali hirsutulo; stylo 4–5 mm longo.

Shrub to 2 m tall, nearly glabrous, the youngest branchlets and leaves sparingly strigose with pale appressed hairs, the inflorescence glabrous; leaves rigidly coriaceous, subsessile, orbicular to broadly ovate, 2–4.5 cm wide, 2–5 cm long, rounded or obtuse at the tip, shallowly cordate with broad rounded lobes at the base; petiole 1.5–2.5 mm thick, 2–3 mm long, much enlarged at the base; midvein flat or convex above, often channeled near the base, prominent beneath; lateral veins 10–15 pairs, somewhat elevated on both surfaces but conspicuous on neither; marginal vein about equaling the laterals and little arched between them, 1–1.5 mm from the margin; mature blades with 20–25 glandular dots per mm^2, these visible as small black dots above, more conspicuous, paler, and convex beneath; inflorescence (at least in the specimens seen) terminal, the panicles 4–8 cm long, 3 times compound, about 50-flowered, each arising from the node above the last leafy node and subtended by an elliptic pale-strigose bract up to 2 mm wide, 4 mm long; other bracts, and bracteoles, deciduous before anthesis; buds 3–3.5 mm long, obovoid, rounded at the apex or obscurely apiculate; hypanthium at anthesis broadly campanulate, apparently coriaceous and wrinkling irregularly in drying, 3 mm long and the orifice about the same diameter, the margin becoming irregularly 5–8-lobulate, the whole prolonged about 2 mm beyond the summit of the ovary; calyptra deciduous soon after the flower opens; style 4–5 mm long; stamens about 100, 5 mm long, the anthers about 0.2 mm long, the staminal ring somewhat hairy; petals 3 or 4, clawed, the blade about 2 mm long and wide; ovary bilocular, the ovules 3–5 in each locule, ascending; fruit oblate, about 7 mm long, 10 mm in diameter; seeds 2, myrcioid, 7 mm long.

The assignment of this species to *Marlierea*, instead of *Calyptranthes*, is somewhat arbitrary. The calyptra breaks off irregularly, and the margin of the hypanthium later splits into several irregular lobes, as in *Marlierea*. The calyptra, however, comprises the whole of the summit of the bud, including the unchanged apiculum; in *Marlierea* the calyx ordinarily splits longitudinally so that parts of the fragmented apiculum remain attached to the individual lobes.

Perhaps the strongest argument for placing the species in *Marlierea* may be found in its similarity to *M. montana*, from which it may be distinguished only by the characters noted in the key.

VENEZUELA: Amazonas, Río Guainía, in sabanita 1 km east of Maroa, 120–140 m elevation, Nov 25, 1953, *Maguire et al. 36400* (MICH, type).

38. **Marlierea summa** McVaugh, sp. nov.

Frutex, vel arbor parva, minute appresseque rufo-pubescens; ramulis paniculisque, et foliorum novellorum superficie saltem inferiore, creberrime pilis rufis 0.1–0.2 mm longis obtectis; ramulis exalatis; foliis rigide coriaceis, 5–9 cm longis; petiolis 4–8 mm longis; paniculis 5–8 cm longis (vel raro brevioribus), multifloris vel interdum 3- vel paucifloris; ramulis accensis nullis; bracteis deciduis; alabastris 3.5–5 mm. longis, apertis, calyce breviter 5-lobo.

Shrub or small tree 1–4 m high, with the branchlets, inflorescence, and at least the lower surface of the young leaves completely covered by very numerous minute closely appressed bright rusty-brown dibrachiate hairs 0.1–0.2 mm long; leaves rigidly coriaceous, glabrous above or sparingly pubescent, at least near the base of the midvein; midvein impressed above, at least near the base; lateral veins 15–25 pairs, closely parallel; marginal vein about equaling the laterals and scarcely arched between them, up to 1.5 mm from the margin; margins somewhat revolute; both surfaces abundantly glandular-punctate; paired panicles many-flowered (or by reduction 3- or few-flowered), 1–3 times compound, the flowers mostly in 3's near the tips; bracts and bracteoles 1.5–2 mm long, deciduous before anthesis; buds 3.5–5 mm long, obovoid; calyx irregular, including the 2 (or 1) broad rounded and curved inner lobes 1.5–1.8 mm long and 2.5 mm wide, which are infolded and completely cover the corolla in bud, and an exterior series of 3 smaller lobes, these nearly flat, obtuse or bluntly triangular, 1–1.2 mm long, 1.5–2 mm wide; all lobes pubescent on both surfaces, or the innermost on the distal half only; hypanthium at anthesis campanulate with a flaring margin, 3.5 mm wide at the orifice, glabrous within, prolonged 2 mm above the summit of the ovary; petals cream-color or white, suborbicular, glabrous or the outermost pubescent on the outer surface, the outermost 2–2.5 mm long and wide, the inner ones successively smaller; stamens 125–150, 3–5 mm long, the anthers 0.3–0.4 mm long; style 4–6 mm long, gland-dotted; ovary bilocular, the ovules 2 in each locule, collateral, ascending from near the base.

A species consisting of 2 well-marked varieties which differ in leaf-characters and in some features of the inflorescence. The flowers of the two varieties are very closely similar and the differences between them are probably no more than to be expected between isolated populations.

Marlierea summa var. **summa.**

Leaves elliptic-ovate (2.5–3 cm wide, 7–9 cm long, 2.5–3.3 times as long as wide) or elliptic-lanceolate (0.7–1.4 cm wide, 3.5–6 cm long, 4–5.5 times as long as wide), caudate-acuminate, usually widest a little below the middle and thence rounded to a cuneate base, the margins decurrent on the stout channeled petiole 6–8 mm long, 1–1.5 mm thick; lateral and marginal veins usually not perceptible on the upper surface, scarcely so on the lower; upper surface coarsely impressed-punctate, green, the lower surface obscured by the hairs or glabrescent in age and then perceptibly punctate; panicles 1.5–5 cm long, the lowest branches up to 3 cm long, the peduncles stout, compressed, up to 2 cm long and 2 mm wide at the summit; hypanthium splitting irregularly at the bases of the calyx-lobes, and the lobes deciduous or the outer series somewhat persistent; petals 3, sometimes with 1 or 2 additional transitional staminode-like structures with imperfect anthers and petal-like blades; immature fruit globose, 5–7 mm in diameter, crowned with the persistent neck of the hypanthium 1 mm high.

VENEZUELA: Terr. Amazonas: Cerro Sipapo (Paráque): Caño Negro, elevation 1400 m, *Maguire & Politi 27688, 27906;* Caño Profundo, elevation 1600 m, *28257;* Caño Negro, elevation 1600 m, *28237* (form with small lanceolate leaves); elevation 1500 m, *28262* (form with small lanceolate leaves), *28270;* East Escarpment savanna, elevation 1900–2000 m, *28644* (MICH, type). Cerro de la Neblina, along west escarpment n of Cumbre Camp, elevation 1700–1800 m, *Maguire et al. 37223* (fruiting specimen).

A collection from eastern Colombia (Vaupés, Río Negro, at confluence of Ríos Guainía and Casiquiare, Caño Ducuruapo, Dec 13–17, 1947, *Schultes & López 9399*, US), is perhaps the same species. The specimen bears nearly mature fruits from which the calyces have fallen except for a few persistent remnants which may represent the remains of a calyptra, or portions of lobes of a marlieroid type. I am unable to find any satisfactory differences between the vegetative portions of this plant and those of *Calyptranthes killipii* Standl., of the Pacific Coast of Colombia, and conceivably it belongs to this species. The leaves in the fruiting specimen are larger than any others known in *Marlierea summa* (up to 13 cm long and about half as wide), they are somewhat rounded at base, with midvein concave rather than impressed, and the upper surface polished at maturity. In general appearance and in characters of the pubescence, however, the collection by Schultes and López strongly suggests its affinity with the other collections of *M. summa.*

Marlierea summa var. **superior** McVaugh, var. nov.

A var. *summa* foliis obtusis vel obtuse breviacuminatis, 1.7–2.4-plo longioribus quam latioribus differt.

Leaves ovate or elliptic, 2–4 cm wide, 5–8.5 cm long, 1.7–2.4 times as long as wide, obtuse or bluntly short-acuminate, obtuse or rounded at the base, the margins abruptly decurrent on the stout channeled petiole 2–2.5 mm thick, 4–5 mm long; lateral veins slightly raised and apparent on both surfaces; both surfaces thickly but finely and inconspicuously punctate; panicles 3–7.5 cm long, the lowest branches up to 2 cm long, the peduncle stout, compressed, 1.5–5 cm long, up to 2.5 mm wide at summit; petals 5.

VENEZUELA: Bolívar: Ilu-tepuí, Gran Sabana, mesa ridge at 1900 m elevation, March 14, 1952, *Maguire 33405* (MICH, type), *Maguire 33378* (MICH).

39. Marlierea umbraticola (H.B.K.) Berg, Linnaea **27**: 17. 1855.

Myrtus umbraticola H. B. K. Nov. Gen. & Sp. **7**: 258 (folio ed. 199). 1825.
Marlierea insculpta Diels, Verh. Bot. Ver. Brandenb. **48**: 188. 1907.

For description see Berg in Mart. Fl. Bras. **14^1**: 35 (1857). Amazonian Bolivia and Brazil to eastern Colombia (the type from Maypures on the Río Orinoco) and southern Venezuela.

VENEZUELA: Amazonas: Esmeralda, upper Orinoco, elevation 130 m, May 18, 1942, *L. Williams 15483* (F). Solano, lower Río Casiquiare, elevation 102 m, March 12, 1942, *Williams 14777* (F). Costa poblada del Caño Macasi, Capihuara, alto Río Casiquiare, elevation 120 m, May 27, 1942, *Williams 15592* (F). Puerto Ayacucho, elevation ca. 100 m, May 1931, *Holt & Blake 801* (F, US). Locality uncertain: In Vasiva Lacûs ripis, Jan 1854, *Spruce 3316* (K).

A collection from Maroa, Río Guainía, Amazonas, Venezuela, elevation 127 m, *L. Williams 14420,* 11–2–1942 (US), probably represents an undescribed species of *Marlierea,* but the material is insufficient for positive identification. The specimen bears nearly mature fruits, which have persistent on them the irregularly broken calyx-margins, and the inflorescence appears to be that of *Marlierea.* The plants are nearly glabrous but bear the remains of what was apparently a sparse appressed pubescence of long pale hairs; the leaves are large and coarse, 7–10 cm wide, 16–20 cm long or more, on petioles 2 mm in diameter, 12–15 mm long; the midvein is convex above; the panicles are 12 cm long, many-flowered; the lateral veins are well differentiated, 12–15 pairs prominent beneath; the marginal vein is 3–7 mm from margin. The plant suggests *M. macrophylla* in many respects, but the petioles are longer and the leaves narrowly rounded at the base and the pubescence is of longer hairs. In the absence of flowers, and without the presence of more distinctive characters of leaves and pubescence, it would be premature to describe this as a new species.

COMBRETACEAE[21]

The three new species of *Terminalia* described below, together with two recently described species, *T. quintalata* Maguire of eastern Guayana, in the Kaieteur Savanna, British Guiana Pakaraima, and Gran Sabana Regions, at 4–1200 m altitude, and *T. yapacana* Maguire of low altitude savannas of western Guayana, notably those of Yapacana, Río Yatúa, and Maróa, constitute a group of species which has, apparently, no close affinity with any other known New World species of the genus.

These five species all have coriaceous or subcoriaceous leaves, obovate to oblong in shape with short, thick, flattened petioles. This type of leaf, or at least something similar, is common enough in Malaysian and Polynesian species, but usually associated with drupe-like fruits. Our species, however, have 4–5 winged fruits with membranaceous wings which can be described in general terms as "*Combretum-like.*" The inflorescences are axillary spikes varying from subcapitate to elongate.

There is little doubt that we have here a rather isolated group of mutually related species, and a new sectional name must be provided for them.

In the New World, the nearest affinity in leaf-type seems to be in *Ramatuela*, an Amazonian genus very closely related to *Terminalia* and not indeed very convincingly separable from the latter. Although it would be going too far to suggest that sect. *Pachyphyllum* in any way represents the ancestry of *Ramatuela*, it is at least true that the discovery of the five species placed in the new section has reduced the gap between *Ramatuela* and *Terminalia* in South America.

Terminalia sect. **Pachyphyllum** Maguire & Exell, sect. nov.

Flores 4–5-meri in spicas axillares pedunculatas elongatas vel subcapitulatas dispositi. Fructus sessilis 4–5-alatus, alis membranaceis. Ramuli crassi. Folia spiraliter ordinata coriacea plerumque conferta breviter petiolata, petiolo crasso applanato.

Type species. *Terminalia virgata* Maguire & Exell.

Key to the Species of *Terminalia* sect. *Pachyphyllum*

1. Fruits mostly 4-winged; leaves usually obtuse to subcordate at the base.
  2. Branchlets and young leaves densely greyish-villous-tomentose; spikes subcapitate to more or less elongate. 1. *T. virgata.*
  2. Branchlets either glabrous or soon glabrescent; spikes subcapitate.
    3. Lower receptacle (ovary) glabrous. 2. *T. opacifolia.*
    3. Lower receptacle (ovary) densely pilose. 3. *T. guaiquinimae.*
1. Fruits mostly 5-winged; leaves cuneate at the base, the lamina merging almost imperceptibly into the petiole.
  4. Fruits up to 10 × 9 mm, slightly longer than broad; leaves obovate to obovate-elliptic, usually 4–9 cm broad when fully developed. 4. *T. quintalata.*
  4. Fruits up to 7 × 9 mm, slightly broader than long; leaves elliptic to narrowly elliptic, up to 3.5 mm broad. 5. *T. yapacana.*

1. **Terminalia virgata** Maguire & Exell, sp. nov. Figure 10.

Arbor virgata flexuosa 6–10 m alta, ramulis dense cinereo-villosis crassis 4–12 mm diam. Folia spiraliter ordinata ± conferta breviter petiolata, petiolo applanato crasso villoso-piloso, lamina coriacea oblonga, 5–8 × 3–4 cm, apice obtusa vel retusa, margine revoluta, basi obtusa vel subcordata. Flores 4 (5)-meri in spicas axillares subcapitatas vel elongatas 1.5 cm longas pedunculatas, pedunculo villoso 2.5–3.0 cm longo, dispositi. Receptaculum inferius (ovarium) dense cinereo-pilosum 4 (5)-angulatum. Fructus ca. 10 mm longus, oblongus sparse pilosulus 4 (5)-alatus, alis tenuibus ca. 2.5 mm latis.

---

[21] By Bassett Maguire and A. W. Exell.

Type: slender virgate flexuous tree 6–10 m high, leaves thickly coriaceous and brittle, ridge near southeast escarpment at 1700 m altitude, Cerro Guaiquinima, Edo. Bolívar, Venezuela, Jan 7, 1952, *Maguire 33000* (holotype NY, isotypes BM, VEN). Paratype: spindly virgate tree 5–12 m high, 5–8 cm diam., leaves coriaceous, strongly inrolled, frequent in open scrub savanna and ridges, North Valley at 1600–1700 m altitude, Jan 4, 1952, *Maguire 32952* (BM, NY).

2. **Terminalia opacifolia** Maguire & Exell, sp. nov. Figure 10.

T. virgatae similis sed ramulis foliisque fere glabris, spicis globoso-capitatis, 1.0–1.5 cm in diam., pedunculis 1.0–2.5 mm longis, glabris. Flores 4-meri. Receptaculum inferius (ovarium) glabrum. Fructus ad hoc ignotus. Receptaculum superius campanulatum extus glabrum, intus dense hirsuto-pilosum.

Type: spindly tree 5–15 m high, 5–8 cm diam., frequent, dense scrubbush (1–2 m high) savanna and ridges, at 1650 m altitude, North Valley, Cerro Guaiquinima, Edo. Bolívar, Venezuela, *Maguire 32951* (holotype NY, isotype BM).

Known only by the type collection from the type locality, where, with those of *T. virgata*, the tall flexuous virgate stems emerge conspicuously above the waist- or head-high level of the open scrub vegetation.

3. **Terminalia guaiquinimae** Maguire & Exell, sp. nov. Figure 10.

T. virgatae et *T. opacifoliae* similis; ramulis glabris vel glabrescentibus; laminis subcoriaceis, oblanceolatis vel oblongo-oblanceolatis; venis primariis prominentibus vel prominulis, reticulatis, glabris vel in vernatione puberulis, nec revolutis nec recurvatis; pedunculis sparse subpilosis; receptaculo inferiori villoso-piloso, lobis calycis extus tenuiter pilosis intus dense villoso-pilosis. Fructus ad huc ignotus.

Type: virgate slender tree 5–12 m high, frequent, ridges and rocky places below Southeast Escarpment at 1600–1700 m altitude, Cerro Guaiquinima, Edo. Bolívar, Venezuela, Jan 7, 1952, *Maguire 33008* (holotype NY, isotype BM).

Paratypes: tree 3–20 m high, leaves glabrous, frequent in open savannas or border of woodland, North Valley at 1600–1700 m altitude, Cerro Guaiquinima, Jan 10–12, 1952, *Maguire 33056* (BM, NY); branched tree (sterile) 10 m high, along open streamcourse, North Valley at 1600–1700 m altitude, Cerro Guaiquinima, Jan 10–12, 1952, *Maguire 33094* (BM, NY).

4. **Terminalia quintalata** Maguire, Bull. Torrey Club **75**: 649. 1948.

BRITISH GUIANA: Potaro River, Kaieteur Plateau, *Maguire & Fanshawe 23459* (BM, NY); Potaro River below Amatuk Portage, *Maguire & Fanshawe 23551* (holotype NY, isotype BM); upper Mazaruni River, Kataima, *Maguire & Fanshawe 32640* (BM, NY). Pakaraima Mts., Mt. Ayanganna, *Maguire, Bagshaw & Maguire 40656* (BM, NY). VENEZUELA: Northwest cumbre, Churi-tepuí, Chimantá-tepuí, at 1200 m alt., *Wurdack 34328* (NY).

5. **Terminalia yapacana** Maguire, Mem. N. Y. Bot. Gard. **8**: 132. 1953.

VENEZUELA: Territorio Amazonas. Alto Río Orinoco, Yapacana Savanna, at 125 m alt., *Maguire, Cowan & Wurdack 30590* (holotype NY, isotype BM); same locality, *Maguire & Wurdack 34552* (NY); *34561* (NY, BM); *36582* (NY); Río Guainía, *Maguire & Wurdack 35716* (NY, BM); *35686* (NY).

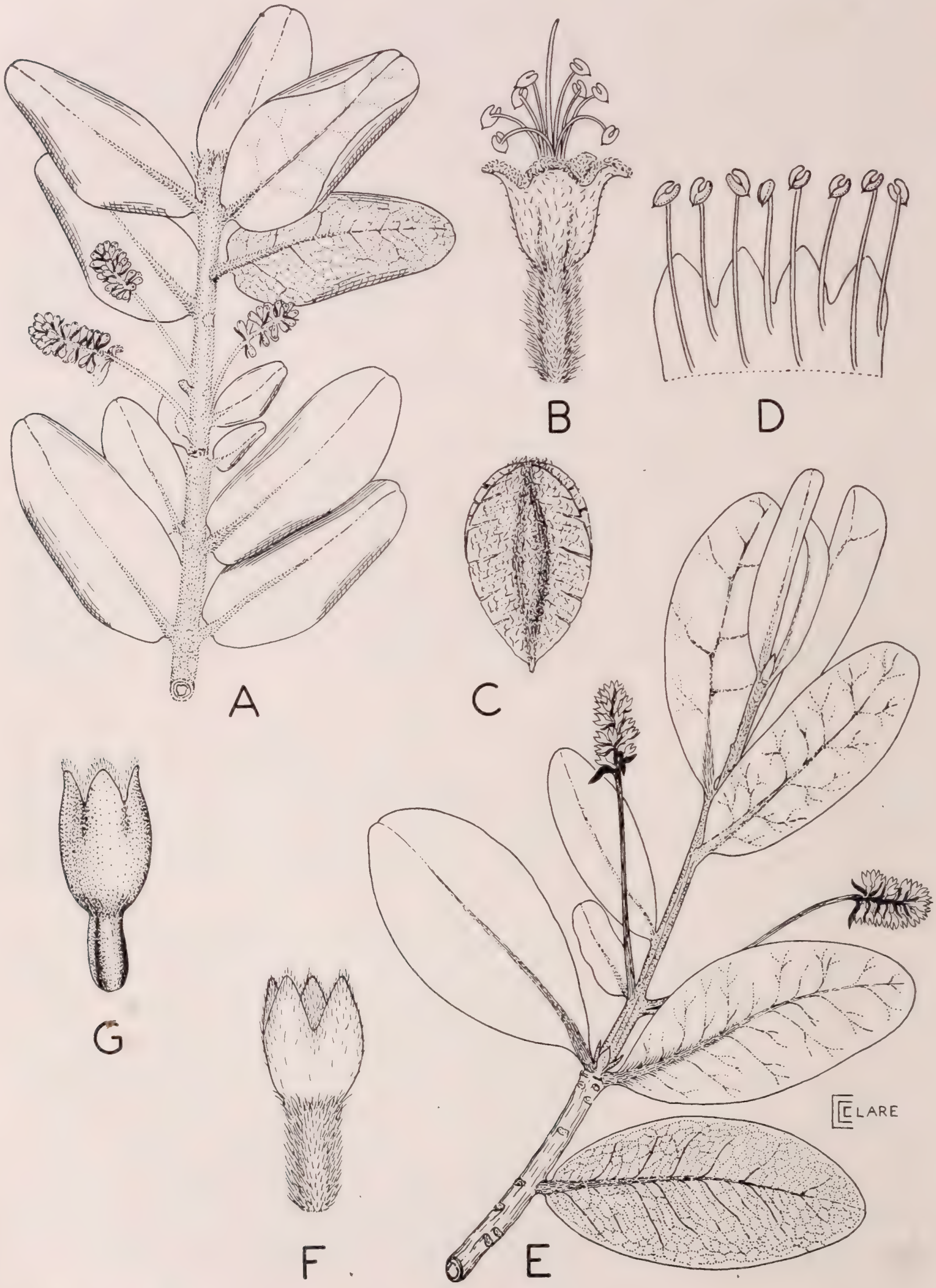


FIG. 10. A–D. *Terminalia virgata.* A, habit, post-flowering specimen, × ½; B, flower, × 4; C, fruit, × 6; D, diagrammatic representation of opened corolla, showing alternating positions of stamen, × 4; drawn from *Maguire 33000.* E–F, *Terminalia guaiquinimae.* E, habit, flowering specimen, × ½; F, flower, × 5; drawn from *Maguire 33008* and *33056.* G, *Terminalia opacifolia,* flower, × 5; drawn from *Maguire 32951.*

MELASTOMATACEAE

Microlicia benthamiana Tr. ex Cogn.

Microlicia bryanthoides Oliv. Timehri **5**: 192. 1886.
Microlicia steyermarkii Gl. Fieldiana Bot. **28**: 425. 1952.

Twenty-nine different collections, twenty of which have been made since 1950, have been studied; included in this material have been the holotypes of all three names. Despite many permutations of these collections, no practical means of separating subspecific categories is apparent. Were such variability accepted within the many Brazilian species of *Microlicia,* the recognized categories would perhaps be one-third of the present total.

The sepal shape, degree of connective prolongation development, and especially the size, shape, and punctation of the leaves of *M. benthamiana* all vary independently of one another in the various collections. The leaves of most recent collections do not quite reach the maximum width of 3 mm seen in *Schomburgk 151.5* (the type number of *M. benthamiana*), although one sprig of *Maguire 33570* has leaves slightly exceeding 3 mm. Several evolutionary pseudopods have appeared, the most definite being in *Maguire & Maguire 40426* and *40391;* in these Serra do Sol specimens, the leaves are remarkably crowded and almost epunctate, only the leaf margins showing glands. Most of the variability within *M. benthamiana* can be seen in the series *Maguire & Maguire 35117, 35278, 35347,* all from Cerro Yutaje. A series showing slightly different lines of variation is the material from Chimantá-tepuí. Morphologically, *M. steyermarkii* is very similar to the type of *M. benthamiana,* with slightly narrower and slightly more punctate leaves.

The following description incorporates the observed variability; Shrubs 0.1–3 m, glabrous. Leaf blades 4–9 × 0.7–3 mm, elliptic to oblanceolate, the apex rounded to acute, the base acute to narrowly acute, above epunctate to densely punctate, below sparsely to densely punctate (the margins in densely punctate leaves appearing subcrenulate), usually faintly trinerved with apically evanescent laterals; petioles scarcely distinct, sometimes calloused, to 0.8 mm long. Flowers solitary on short foliose branches. Hypanthium 2–3.5 mm long, more or less densely covered with reddish to yellow glands. Sepals 2–4.6 × 0.6–1.5 mm, usually about equaling the hypanthium in length, linear to narrowly triangular, acute (in *Maguire & Maguire 35347* tipped with a seta to 0.3 mm long). Petals 6.8–12 × 3.5–6.8 mm, asymmetrically obovate to subelliptic, usually pink (one plant, *Steyermark & Wurdack 442,* with white petals, among a large pink-petaled population). Large stamens: filaments 3–5.5 mm; anthers short-rostrate, 2–2.8 mm long; connective below the anther 2.1–5.6 mm to the filament insertion, straight for about ¾ of this length, below the insertion 1.2–2.3 × 0.3–1 mm and gradually widened to the rounded to truncate apex. Small stamens: filaments 2.4–5.3 mm; anthers short-rostrate, 1.3–2.4 mm long; connective below the anther 0.5–2.4 mm to the filament insertion, straight for almost the entire length, below the insertion 0.3–0.9 × 0.2–0.35 mm and scarcely widened to the rounded to slightly emarginate apex.

Microlicia guanayana Wurdack, sp. nov.

A congeneribus brasiliensibus differt forma foliorum.

Fructiculus erectus, ramis superne satis ramosis modice incurvo-puberulis pilis non glandulosis. Folia internodiis longiora; lamina 6– × 1.2–1.5 mm,

oblanceolata basi attenuata apice hebetiacuta et in seta 0.5–1 mm longa terminata, supra modice laxeque strigulosa, subtus dense strigulosa, marginibus setoso-ciliatis ciliis ad 1 mm longis, uninervia i.s. flavida tenuis sed rigidiuscula supra et subtus dense impresso-punctata. Flores breviter (0.5–1.5 mm) pedicellati; hypanthium ad torum 3 mm longum modice granuloso-glandulosum breviter subsparseque eglanduloso-puberulum setis intercalycinis paulo grandioribus; calycis tubus 0.3 mm longus, lobis 3 × 1 mm anguste triangularibus extus sparse puberulis apice anguste acutis et in seta 1–1.5 mm longa terminatis. Petala 10–10.5 × 4.5 mm, anguste obovata obtusa minute apiculata in seta brevi terminata. Stamina maiora: filamenta 5 mm longa; antherae 2 mm longae; connectivum sub anthera ad insertionem filamenti 3.2 mm longum, in appendicem 1.7 × 0.6 mm productum. Stamina minora: filamenta 4.5 mm longa; antherae 1.7 mm longae; connectivum sub anthera ad insertionem filamenti 1.4 mm longum, in appendicem hebetem 0.4 × 0.3 mm productum. Ovarium stylusque ut in genero.

Type: diffuse shrub, flowers pink, frequent on summit of Cerro Guanay, Caño Guaviarito, Río Manapiare, Río Ventuari, Terr. Amazonas, Venezuela, elev. 1800 m, Feb 2, 1951, *Bassett Maguire, Kathleen D. Phelps, Charles B. Hitchcock & Gerald Budowski 31727* (NY).

In Cogniaux' arrangement of *Microlicia*, *M. guanayana* would key to the pubescent group of species with punctate one-nerved leaves, centering around *M. cuneata* Naud., *M. acuminata* Cogn., *M. hirsutissima* Naud., *M. regeliana* Cogn., and *M. albida* Pilger. The relatively much narrower bluntly acute leaves distinguish the Guanay species from these Brazilian congeners. Actually, *M. guanayana* would probably be better regarded as a pubescent near relative of *M. benthamiana*.

Rhynchanthera virgata Wurdack sp. nov.

Sect. *Isostemones*. *R. hookeri* Naud., *R. villosissimae* Cogn., *R. paludicolae* (Donn. Sm.) Gl. affinis sed habitu dissimili et pubescentia hypanthi breviore.

Simplicicaulis, caule longe (2–5 mm) robuste densiusculeque glanduloso-setoso. Petiolus 5–12 mm, pubescentia caulis eadem; lamina ad 5.5 × 3 cm (apicem versus gradatim minor), ovata apice acuta basi rotundata bis subcordata 7-nervia (nervis duobus exterioribus paulo debilibus) supra et subtus laxe modiceque glanduloso-strigosa (setis 1/mm^2, ad 2 mm longis, glandulis aliquantum caducis) marginibus setoso-ciliatis denticulatis. Inflorescentia anguste thyrsoideo-paniculata, ramis adscendentibus brevibus ad 3 (–5) cm longis. Hypanthium 2.5–3 × 2–2.5 mm, inconspicue glanduloso-puberulentum pilis debilibus 7–10/mm^2, ad 0.15 mm longis; sepala vix (0.2 mm) coalita 2.7–2.9 × 0.8–1 mm faucibus glabris marginibus cum setis 2–4 glandulosis 1.5–2.5 mm longis armatis. Petala obovato-rhomboidea vel elliptica 13–13.5 × 7–7.5 mm apice acuta seta glandulosa ornata marginibus apicem versus glanduloso-ciliolatis. Stamina fertilia: rostrum 0.9 mm longum circum porum dilatatum; anthera propria 4.2 mm longa, connectivo ad basim per 2.6 mm producto ab articulatione antice non producto; filamentum 4.3 mm longus. Staminodia 2.5 × 0.2 mm. Ovarium triloculare apice modice glanduloso-puberulum; stylus 12 × 0.4 mm, basim versus sparsissime glanduloso-puberulus; stigma truncatum.

Type: unbranched annual 1.5–5 dm tall, occasional in weedy grassy intervale, headquarters area, Rio Cabosobral, elev. 800 m, Serra Tepequem, Terr. do Rio Branco, Brazil, Nov 19, 1954, *Bassett Maguire & Celia K. Maguire 40000* (NY).

The three postulated relatives of *R. virgata* are well-branched shrubs with moderately to densely setose hypanthia and bituberculate ventral stamen connective bases; all have glandular-puberulent or glandular-setose ovary apices.

Rhychanthera grandiflora (Aubl.) DC.

Rhyncanthera intermedia Ule, Notizbl. Bot. Gart. Berlin **6**: 348. 1915.
Rhyncanthera orinocensis Sprague, Trans. Proc. Bot. Soc. Edinb. **22**: 431. 1904.

Gleason (Brittonia **1**: 134. 1932.) pointed out the variability in cauline pubescence to be found in the British Guiana specimens of *R. grandiflora*. Collections since 1932 have obscured the lines between the "well-marked" forms noted by Gleason. Both Ule's and Sprague's collections (as represented at Kew) are so similar as to appear parts of the same collection number; both have long-pilose stems. As suggested by Gleason, *R. acuminata* Benth. and *R. betulifolia* Cogn., upon comparison with presently available collections, will probably follow *R. intermedia* and *R. orinocensis* into synonymy.

R. grandiflora is perhaps the commonest shrub in the Venezuelan morichales and is also frequent in moist areas along roadsides in the llanos. Plants may be found in flower at any time of the year, depending on the seasonal wetness of the habitat. Successive rings of plants flower around a morichal as the water level lowers during the dry season; each plant, as the water level drops, gradually defoliates and ceases flowering. Robust colonies grow in almost soilless but seasonally moist depressions on the crystalline lajas at Puerto Ayacucho.

As delimited in the past, the genus *Poteranthera* has been composed of three discordant elements; the species of sect. *Onoctonia* are congruous with *Acisanthera*, the generotype seems to belong in the *Tibouchineae* as a monotypic genus related to *Acisanthera*, and the remaining species are well placed in the genus *Siphanthera*. These adjustments will be treated in detail in a future paper, only one transfer being made at present to accommodate the discussion of a new Venezuelan species of *Siphanthera*.

Siphanthera foliosa (Naud.) Wurdack, comb. nov.

Tulasnea foliosa Naud. Ann. Sci. Nat. III. **2**: 143. 1844.
Poteranthera foliosa (Naud.) Cogn. in DC. Monogr. Phaner **7**: 121. 1891.

Siphanthera cowanii Wurdack, sp. nov.

A congeneribus antherarum rostris brevibus insignibus differt staminibus minoribus quasi perfectis cum rostris evolutis.

Herba supra ramosa ad 35 cm alta glabra (nodis et sinibus intercalycinis exceptis); nodi interfoliares pauco-setosi, setis ca. 1 mm longis. Folia 10–30 × 0.5–2 mm linearia acuta apiculata sessilia margine integra (raro apicem versus paucidenticulata). Inflorescentia laxe paniculata; flores ad 1 cm pedicellati 4-meri. Hypanthium 1.2–1.4 mm longum (fructiferum maius). Sepala 2.5–3.0 ×1.3–1.6 mm, ovato-deltoidea apice acuminata apiculata, sinibus intercalycinis unisetosis seta 0.4–0.5 mm longa. Petala 2.5–2.7 × 2.2–2.5 mm, asymmetrice obovata vel subrotundata, apice minute apiculata rotundata vel subtruncata. Stamina antesepala: filamenta 2.4–2.5 mm longa; thecae (rostro connectivoque exceptis) 0.8–1.2 mm longae, oblongae, rostro 0.3–0.7 mm longo, minute (0.1 mm) uniporoso, connectivo sub theca 0.2 mm producto basi truncato vix incrassato. Stamina alternisepala: filamenta 2–2.1 mm longa; thecae (rostro connectivoque exceptis) 0.7–0.8 mm longae, ovato-oblongae, rostro 0.3–0.5 mm longo, connectivo sub theca 0.3–0.4 mm producto, basi truncato incrassato 0.3 mm lato. Stylus

3–4.5 × 0.1mm apice non incrassatus; stigma truncatum. Ovárium biloculare; semina 0.4–0.5 × 0.2 mm elliptica laxe elongato-aerolata areolis minutissime punctatis.

Type: flowers purplish pink, frequent in sabanita at northwest base of Cerro Moriche, Río Ventuari, Terr. Amazonas, Venezuela, elev. 150 m, Jan 17, 1951, *Bassett Maguire, Richard S. Cowan, and John J. Wurdack 30993* (NY). Paratypes: locally frequent in Savanna No. 3, northwest base of Cerro Yapacana, elev. 125 m, Terr. Amazonas, Venezuela Jan 1, 1951. *Maguire, Cowan*, and *Wurdack 30531;* same locality, Nov 20, 1953, *Maguire, Wurdack, and Bunting 36588.*

The vegetative aspect, except for the lack of glandular pubescence, is like that of *S. foliosa.* The stamens, however, are very different.

Siphanthera cordiforia (Benth.) Gleason.

S. jenmani Gleason, Brittonia **1**: 137. 1932.
S. cordifolia (Benth.) Gleason var. *glomerata* Gleason, Fieldiana Bot. **28**: 426. 1952.

I have now seen 25 collections of this complex and believe that *Jenman 1039, Sandwith 1345*, and *Maguire & Fanshawe 23161* represent ± glabrous ± eglandular collections of the more typically hairy and glandular *S. cordifolia;* intermediate are such collections as *Tate 1131, Tate 341*, and *Steyermark 59345*, with *Steyermark & Wurdack 448* showing extreme variability within one population. Var. *glomerata* is almost the same as the type of var. *cordifolia;* such glomerate-headed plants occur randomly in populations of *S. cordifolia* and probably are pathologic in origin. Indeed specimens with relatively lax inflorescences are more different in appearance from *Schomburgk 1062* than is *Steyermark 59397.* There seem to be no critical floral features for any varietal differentiation. Perhaps the most distinct collection of the complex is *Schultes & Cabrera 14359* (NY) from Cerro Yapoboda, Vaupés, Colombia; the leaves have much more distinct petioles and the leaf bases are only rounded rather than cordulate. Otherwise the Colombian collection is *S. cordifolia* from the glabrous end of the specific spectrum.

Acisanthera hedyotidea (Presl) Tr.

Gleason (Rec. Trav. Bot. Néerl. **32**: 205. 1937) has elaborated the confusion surrounding *A. hedyotidea.* I have examined the Kew specimen annotated by Triana and attributed by him to Salzmann; the label reads "Bahia; in paludibus.—Rhexia microphylla." without collector indicated. Certainly this Bahia specimen is conspecific with *A. boissieriana Cogn.* The several collections from northeastern South America agree in essential details with Presl's and Naudin's descriptions and plates for *Dicranthera hedyotidea* and *D. salzmannii.* Presl's habit sketch shows old hypanthia and flowering hypanthia with no buds and I believe his generic statement concerning absence of petals even in buds is incorrect (indeed unique in the Melastomaceae, if true).

Specimens examined: VENEZUELA: Carabobo, "Chirgua," *Alston 5953* (NY); Bolívar, morichales near Ciudad Piar, *Maguire, Wurdack & Bunting 35898* (NY), *35919* (NY). BRITISH GUIANA: Sand Creek, Rupununi River, *Wilson-Browne 38* (NY); "Roraima," *Schomburgk 515/827B* (K). SURINAME: "E rege Para," *Wullschlagel 168* (Isosyntype of *A. Boissieriana*, NY). BRAZIL: Bahia, *"Salzmann" s.n.* (K, isotype of *D. salzmannii?*); Para, *Spruce 228* (K); Amazonas, Manaus, Colonia Machado, Ule 5997 (K, L).

Acisanthera tetraptera (Cogn.) Gleason.

Comolia bracteosa Huber, Bull. Soc. Bot. Gen. II. **6**: 191. 1914.
Acisanthera bracteosa (Huber) Hoehne, Anex. Mem. Butantin **1**: 54. 1922.

I have examined the following Museu Goeldi specimens, all collected by Ducke and determined by Huber: *8008* (holotype of *C. bracteosa*), from Alto Ariramba, 20/XII/1906; *10465*, from Campos de Faro, 17/I/1910; *11636*, from Campo grande, Parintins, 8/V/1911; and *12101*, campinha de cabeceira de Lago Itapecuru, 30/VII/1912. These Brazilian collections agree perfectly with the Guianan material of *A. tetraptera*. The hypanthium and calyx are sparsely to moderately fine-setulose with gland-tipped hairs along the nerves, and not glabrous as described by Huber.

Macairea lanata Gleason subsp. **eglandulosa** Wurdack, subsp. nov.

Foliorum facierum superiorum inferiorumque et ramorum pili non glanduliferi. Staminum filamenta quandoque apicem versus cum glandulis brevistipitatis 1–2 ornata.

Type: shrub 0.2–0.4 m, flowers pink, abundant in sabanita 1 km east of Maroa, elev. 120–140 m, Río Guainía, Terr. Amazonas, Venezuela, Nov 27, 1953, *Bassett Maguire, John J. Wurdack, & George S. Bunting 36440* (NY).

Paratypes: same locality, April 16, 1953, *Maguire & Wurdack 35675*; Sabana El Venado on left bank of Caño Pimichín above Pimichín, elev. 140 m, Terr. Amazonas, Venezuela, *Maguire, Wurdack & Bunting 36348*; Sabana El Venado, April 14, 1953, *Maguire & Wurdack 35560*.

Typical *M. lanata* has been collected only in the cumbres of Cerros Duida and Paru. The cumbre subspecies has the shorter tubercle-tipping hairs on the upper leaf surface gland-tipped (the longer ones being eglandular) and the lower leaf-surface with many short gland-tipped hairs as well as longer glandular or eglandular ones; the branch hairs at least in part are gland-tipped. The stamen filaments in the cumbre collections always seem to be eglandular. In the population centered around Maroa and Caño Pimichín, all upper leaf-surface hairs are long and eglandular. The filament glands in the lowland subspecies are sporadic within the same flower and sometimes are completely lacking; a few stamen connective appendages with a single gland were observed. One intermediate between the two subspecies has been collected: *Maguire, Cowan, & Wurdack 30890*, from a dry montane savanna on the east slopes of Cerro Moriche, Río Ventuari, elev. 800 m. In this collection, some of the upper leaf-surface and many of the lower leaf-surface hairs are gland-tipped, but a very few stamen filaments bear glands.

Macairea axilliflora Wurdack, sp. nov.

M. stylosae Tr. in folia similis sed cum floribus subsessilibus multo minoribus ovario biloculari.

Frutex ramosissimus glaber glutinosus. Petiolus 5–8 mm longus; lamina 2.5–5 × 1–2 cm, elliptica vel vix obovato-elliptica apice hebetiacuta basi in petiolum sensim attenuata vix (1–2 mm) triplinervia bis debiliter 5-plinervia margine integerrima subtus densissime minutissimeque albido-granulosa. Flores in foliis superioribus axillares (1–4 pro folio) bracteis parvis suffulti vix (0.5–1 mm) pedicellati. Hypanthium 2 mm longum, glutinosum dense albido-granulosum; calycis tubus 0.3 mm longus, lobis 1.1 × 0.8 mm triangularibus apice breviter acuminatis basi distantibus. Petala 5 × 2.5 mm, oblongo-obovata apice acuta. Stamina in magnitudine paulo dimorpha glabra; filamenta 3.2–3.8 mm longa; antherae lineares non rostratae, ca. 2–2.2 mm longae, connectivo sub loculis 0.6–0.7 mm producto, basi incrassato postice 0.2–0.3 mm producto antice

0.1–0.2 mm bilobulato. Ovarium biloculare apice dense cum glandulis sessilibus praeditum; stylus glabor 7 × 0.3 mm; stigma punctiforme; capsula bilocularis, seminibus 0.8 × 0.5 mm cochleatis densissime minuteque foveolatis.

Type: shrub 0.3–2 m tall in large colonies at edge of savanna on right bank of Río Pacimoni 50 km above mouth, elev. 100–140 m, Terr. Amazonas, Venezuela, Feb 7, 1954, *Bassett Maguire, John J. Wurdack, & George S. Bunting 37601* (NY).

Paratypes: shrub 1 m, buds pink, abundant in savanna on left bank of Caño Hechimoni 8 km above mouth, Río Siapa, Terr. Amazonas, Feb 9, 1954, *Maguire, Wurdack, & Bunting 37668*; bushy shrub ca. 6 dm tall in fruit, edge of clearing on east bank of Río Casiquiare 300 meters below mouth of Río Pacimoni, Terr. Amazonas, April 19, 1953, *Maguire & Wurdack 35724*.

M. axilliflora represents the ultimate reduction in the genus, with its tiny flowers and bilocular ovary. The vegetative analogy with *M. stylosa* (which grows in the same area) is obvious. However, *M. stylosa* has somewhat larger leaves, much larger long-pedicelled flowers in peduncled axillary cymes, sparsely glandular-pubescent styles and filaments, and quadrilocular ovaries. The flower size and bilocular ovary of *M. axilliflora* are very suggestive of *Sandemania*. The two species of *Sandemania* are pubescent shrubs with terminal panicles, rostrate anthers, and eglandular ovaries. None of the material of *M. axilliflora* was in anthesis, the diagnosis being compiled from old flower remnants still clinging to the fruiting specimens.

Macairea neblinae Wurdack, sp. nov.

M. rigidae Benth. affinis sed cum foliis anguste ovatis ramulorum sterilium pubescentia fusco-rubra erecta ovario sicut capsula plerumque 4-loculari.

Rami obtuse quadrangulares, juveniles densissime cum pilis patulis robustis glanduliferis i. s. fusco-rubris (demum fusco-brunneis) ca. 1 mm longis vestiti. Petiolus 0.7–1.3 cm longus, pilis ramorum eisdem; lamina 3.5–6 × 2–3 cm, anguste ovata apice hebetiacuta basi obtusa 5-nervia (nervis extimis prope margines), supra dense tuberculato-strigosa tuberculis 1–2/mm^2 cum seta glandulifera armatis, subtus dense glanduloso-puberula et leviter venoso-foveolata. Panicula terminalis pedunculis pedicellis bracteis hypanthio calycis lobisque modice glanduloso-hirtellis pilis fusco-rubris; pedicelli supra bracteolas 2–4 mm. Hypanthium 2.4 × 2.5–2.7 mm.; calycis lobi 2.3–2.5 × 0.3 mm, subulati. Petala 6–6.5 × 3.5–4.0 mm, asymmetrice rhomboidea seta unica glandulifera armata extus minute granulosa alioqui glabra. Stamina paulo inaequalia filamentis modice (praecipue supra) glanduloso-puberulis. Stamina maiora: anthera 2.9–3.0 mm, connectivo sub loculis 0.7–0.8 mm, appendice cordata 0.6–0.7 × 0.6–0.7 mm; filamentum 4.7–5.7 mm. Stamina minora: anthera 2.4 mm, connectivo sub loculis 0.4 mm, appendice 0.5 × 0.5 mm; filamentum 3.5 mm. Ovarium 4-loculare, apice dense glandulifero-setulosum pilis 0.3–0.4 mm longis; stylus 5 × 0.2–0.35 mm, basim versus sparse glanduloso-setulosus; capsula plerumque 4-locularis, seminibus 0.6 × 0.4 mm cochleatis minute foveolatis.

Type: shrub 1–2 m, fruiting, frequent on upper escarpment slopes east of Camp 3, elev. 1700 m, Cerro de la Neblina, Río Yatua, Terr. Amazonas, Venezuela, Dec 27, 1953, *Bassett Maguire, John J. Wurdack, & George S. Bunting 36935* (NY).

Paratypes: same locality, Dec 24, 1953, *36849*; open headland 8 km north of cumbre camp, elev. 1900 m, Cerro de la Neblina, Jan 10, 1954, *37198*; along escarpment overlooking Caño Grande below cumbre camp, elev. 1650 m, Cerro de la Neblina, Jan 10, 1954, *37212*.

The young stem pubescence of *M. rigida* is long and appressed, the leaf-blades are generally widest above the middle (obovate), and the ovary and fruit are predominantly 3-celled. Among the *Macairea* species keyed by Gleason (Bull. Torrey Club **61**: 35–40. 1934), *M. neblinae* would fall in Species Group II. The sepal shape differentiates *M. radula* (Bonpl.) DC. and *M. pachyphylla* Benth.; the larger 3-nerved leaves and relatively longer sepals separate *M. viscosa* Ducke. *M. theresiae Cogn.* (ex char.) has larger 3-nerved leaves, subsessile flowers, and shorter sepals. The collections of *M. neblinae* are predominantly fruiting but sufficient old flowers remain for diagnosis.

Tibouchina fraterna N. E. Brown subsp. **paruana** Wurdack, subsp. nov.

A subsp. *fraterna* differt pubescentia hypanthii toto longiore, calycis lobis angustioribus.

Pili hypanthii (1–) 2–5 mm longi. Calycis lobi vix 1 mm lati longe (ad 1.5 mm) ciliati extus longe (plerumque 1–1.5 mm) squamuloso-strigosi.

Type: shrub 1 m, frequent in cumbre along west rim just north of camp caño head, elev 2000 m, Serrania Paru, Terr. Amazonas, Venezuela, Jan 31, 1951, *R. S. Cowan & J. J. Wurdack 31060* (NY). Paratype: same locality and date, *Cowan & Wurdack 31097*.

In *T. fraterna* ssp. *fraterna*, the hypanthial pubescence (except for the sinal setae) is about 1 mm long; the calyx lobes are 1.5–2 mm wide, short-ciliate (the hairs about 0.5 mm long), and outside short-squamose (the squamae about 0.5 mm long). In foliage, the two subspecies seem identical.

Tibouchina dissitiflora Wurdack, sp. nov. Figure 11, h-m, q.

T. fraternae N. E. Br. affinis sed floribus maioribus solitariis, pubescentia foliorum subtus aliter; *T. duidae Gl.* et *T. sipapoanae* Gl. affinis sed foliis distincte trinerviis.

Fruticosa; ramuli, petioli, folia subtus, hypanthium, sepalaque squamis plusminusve ciliolatis omnino obsiti. Petioli crassi 2–4 mm longi; lamina crasse coriacea 1–2.5 × 0.8–1.5 cm, elliptica vel suborbicularis, apice late acuta vel obtusa et plerumque breviter apiculata, basi acuta vel obtusa, trinervia vel indistincte 5-nervia (nervis lateralibus a marginibus 1–2 mm distantibus) nervis supra insculptis subtus elevatis, supra striolata et in lineis longitudinalibus distinctis elevatis inter nervos indistincte vel distincte squamulosa. Flores 5-meri in ramulis solitarii sessiles vel vix (ad 1 mm) pedicellati, bracteis 2–4 liberis investi, bracteis duabus extimis foliaceis et petiolatis vel bracteosis et sessilibus, 8–11 × 3–5 mm, extus squamosis intus striolatis vel apicem versus squamosis et basim versus glabris, duabus intimis sessilibus ovatis extus squamosis intus glabris. Hypanthium 6–6.5 × 5–6 mm.; calycis tubus 0.5 mm altus, lobis 7–11 3–3.5 mm, ovatis vel ovato-triangularibus apice acutis vel parce acuminatis intus glabris. Petala 12–19 × 8–17 mm, obovata oblique truncata vel rotundata breviter glanduloso-ciliolata. Stamina paulo dimorpha glabra, thecis apice attenuatis. Stamina maiora: filamenta 7–10.5 mm; thecae 6.5–7.5 mm, connectivo sub thecis 2–3 mm producto basi vix (ad 0.7 mm) hebetibilobulato. Stamina minora: filamenta 6–9.5 mm; thecae 6–7 mm, connectivo sub thecis 1.3–1.7 mm producto basi vix (ad 0.5 mm) hebetibilobulato. Stylus 12–16.5 × 0.7 mm glaber vel sparsissime squamulatus; ovarium 5-loculare in parte dimidiali apicali squamosum vel squamoso-setosum.

Type: shrub 0.2–1 m, petals magenta, frequent in west escarpment savanna 4–8 km southwest of cumbre camp, elev. 1850–1900 m, Cerro de la Neblina, Río Yatua, Terr. Amazonas, Venezuela, Jan 15, 1954, *Bassett Maguire, John J. Wurdack, & George S. Bunting 37294* (NY).

Paratypes: *Maguire, Wurdack, & Bunting 37053, 37086, 37142,* all from the cumbre of Cerro de la Neblina; rocks on west ridge summit, elev. 1800 m, Cerro Guanay, Terr. Amazonas, Venezuela, Feb 4, 1951, *Maguire, Phelps, Hitchcock, & Budowski 31772;* summit of Cerro Yutaje, elev. 2200 m, Terr. Amazonas, Venezuela, Feb 17–19, 1953, *Maguire & Maguire 35321.*

T. fraterna (fig. 11p) has much smaller flowers in terminal panicles; the squamules of the lower leaf surface are much narrower, with the free ends not overlapping one another. *T. sipapoana* (Fig. 11s) has smaller one-nerved leaves. The Guanay and Yutaje collections of *T. dissitiflora* show relatively shorter less acuminate calyx-lobes, but subspecific separation from the Neblina population does not seem justified at present.

Comolia serpyllacea Wurdack, sp. nov. Figure 11, a-g.

Inter congenera habitu foliis staminibusque bene distinctis.

Caules repentes lignosi rubri vel brunnei quadrangulares, cum pilis rubris vel brunneis flexuosis 1–1.5 mm longis densiuscule vestiti. Folia breviter (0.3–0.8 mm) petiolata; lamina 2.5–4 × 1–1.5 mm, plana elliptica vel paulo ovato-elliptica apice acuta et brevissime (0.1 mm) setuloso-mucronulata basi acuta uninervia, margine integerrima vel apicem versus utrinque 1–2-dentata dentibus unisetosis, glabra vel apicem versus supra cum setis 1–3 appressis ca. 0.5 mm longis. Flores in ramis lateralibus solitarii, pedicellis supra bracteas 4–6 mm gracili-setosis. Hypanthium 3.2–3.6 × 2.3–2.5 mm, modice (3–5/mm^2) glanduloso-setosum, setis ad 1 mm longis. Sepala supra torum 0.5 mm coalita, lobis 2.3–2.7 × 1.2 mm, oblongis apice late acutis extus glabris, marginibus et intus apicem versus sparse glanduloso-setosis. Petala 13–14.5 × 10.2–10.7 mm, obovata apice rotundata marginibus apicem versus sparse glanduloso-ciliolatis. Stamina glabra in forma isomorphica, antheris rectis apice subulatis minute uniporosis. Stamina maiora: filamenta 4.2–4.5 mm; antherae 2.8–3.6 mm, connectivo sub loculis 0.5–0.7 mm producto ventraliter vix (0.2 mm) bilobato. Stamina minora: filamenta 3.5–3.7 mm; antherae 2.4–3.0 mm, connectivo sub loculis 0.3–0.5 mm producto ventraliter imperspicue bilobato. Ovarium glabrum biloculare multiovulatum; stylus glaber 7–8 × 0.2–0.4 mm apicem versus gradatim contractus; stigma punctiforme.

Type: petals deep purple basally yellow, anthers yellow, forming dense festoons on vertical cliff face under waterfalls, upper part of Caño Culebra, elev. 1500–1600 m, Cerro Duida, Río Cunucunuma, Terr. Amazonas, Venezuela, Nov 21, 1950, *Bassett Maguire, Richard S. Cowan, & John J. Wurdack 29635* (NY).

Paratypes: repent, mat-forming, petals magenta, anthers yellow, common on ledges on upper escarpment face, elev. 1300–1700 m, Cerro Huachamacari, Río Cunucunuma, Terr. Amazonas, Venezuela, Dec 5, 1950, *Maguire, Cowan & Wurdack 29886:* creeping in liverworts, petals pink, anthers yellow, upper escarpment slopes east of Camp 3, elev. 1700 m, Cerro de la Neblina, Río Yatua, Terr. Amazonas, Venezuela, Dec 24, 1953, *Maguire, Wurdack & Bunting 36844;* idem, Dec 27, 1953, *36923;* idem, elev. 1600 m, Jan 24, 1954, *37372.*

The habit and nearly isomorphic stamens of *C. serpyllacea* preclude any consideration of sect. *Dicrananthera* of the genus *Acisanthera*. Within *Comolia*, the Neblina species would be placed in Sect. I near *C. leptophylla* (Bonpl.) Naud. because of the bilocular ovary and one-nerved leaves; *C. leptophylla* has a different habit, glabrous branches, much longer leaves, and stamen connective conspicuously prolonged ventrally. The stamens of *C. serpyllacea* are more reminiscent of *C. montana* Gleason and *C. coriacea* Gleason although the basal connective thickening of those species is more pronounced. The small leaves are somewhat reminiscent of those of *C. sertularia* (DC.) Tr. but the habit, curved leaf-margins, glandular-puberulent branches and lower leaf-surfaces, long stamen connectives, and quadrilocular ovary of the Brazilian species make the resemblance seem superficial. The Brazilian genus *Fritzschia* has similar leaves and stamen connective prolongation but glabrous stems, foliage, and hypanthium, more abruptly truncate anthers, and 4-locular ovary.

Vegetative variability in savanna plants is usually quite great; dimensional floral variation is also significant. The latter type of variability is certainly influenced by the flowering period, with the later flowers on a single plant often being much smaller; this phenomenon can be seen wherever a large stand of *Rhynchanthera serrulata* (Rich. ex Bonpl.) DC. or *Pterogastra minor* Naud. is found. In *Tibouchina spruceana* Cogn., the last few flowers on a plant often are semiabortive with distorted petals and sterile stamens.

Gleason has several times suggested the possibility of heterostyly in Andean *Miconia* of sect. *Cremanium*. Such floral diversity, if finally recognized taxonomically will lead to the synonymy of many species of *Miconia*. For specific limits in the rare genus *Pachyloma*, it has seemed necessary to recognize a floral latitude uncountenanced previously, with basic criteria being vegetative.

This genus is restricted to the savannas of the upper Río Negro and upper Orinoco drainages. Although it was described in 1828, it has hitherto been known by only five collections, with three described species. Additional recent collections by Schultes and ourselves have both clarified and confused the species. Upon examination of single branches, the most striking floral character is the connective development differences in the two whorls of stamens. However, while the dimorphic or essentially monomorphic character of the stamens seems relatively constant for single sprigs, examination of entire collections reveals quite a disturbing floral variability in the sprigs assigned to a single collection number, despite vegetative constancy in the collection. The heterostemonous feature is especially evident in the Schultes collections from the Río Vaupés drainage. Within the recent Venezuelan collections, the stamen variability exists, although less striking fashion. One other disturbing phenomenon is the presence or absence of glandular hairs on style and/or filaments of some collections both Colombian and Venezuelan. Since both *P. coriaceum* and *P. huberioides* are spare shrubs, a collection number includes branches from several plants, at least in the Venezuelan collections.

I am indebted to the United States National Herbarium for the opportunity to examine all the specimens for each Schultes & Cabrera collection number. The herbaria at Munich and Paris have permitted the study of the holotypes of *P. coriaceum* and *P. huberioides*. Drs Baehni and Weibel of Geneva kindly supplied information from the de Candolle herbarium and on the relations between Martius and de Candolle.

Pachyloma DC. Prodr. **3:** 122. 1828.

Urodesmium Naud. Ann. Sci. Nat. III. **15:** 338. 1851.

Flowers 4-merous. Hypanthium campanulate to urceolate, the calyx-lobes fleshy and inconspicuous. Petals oval to obovate, acute to mucronulate-obtuse,

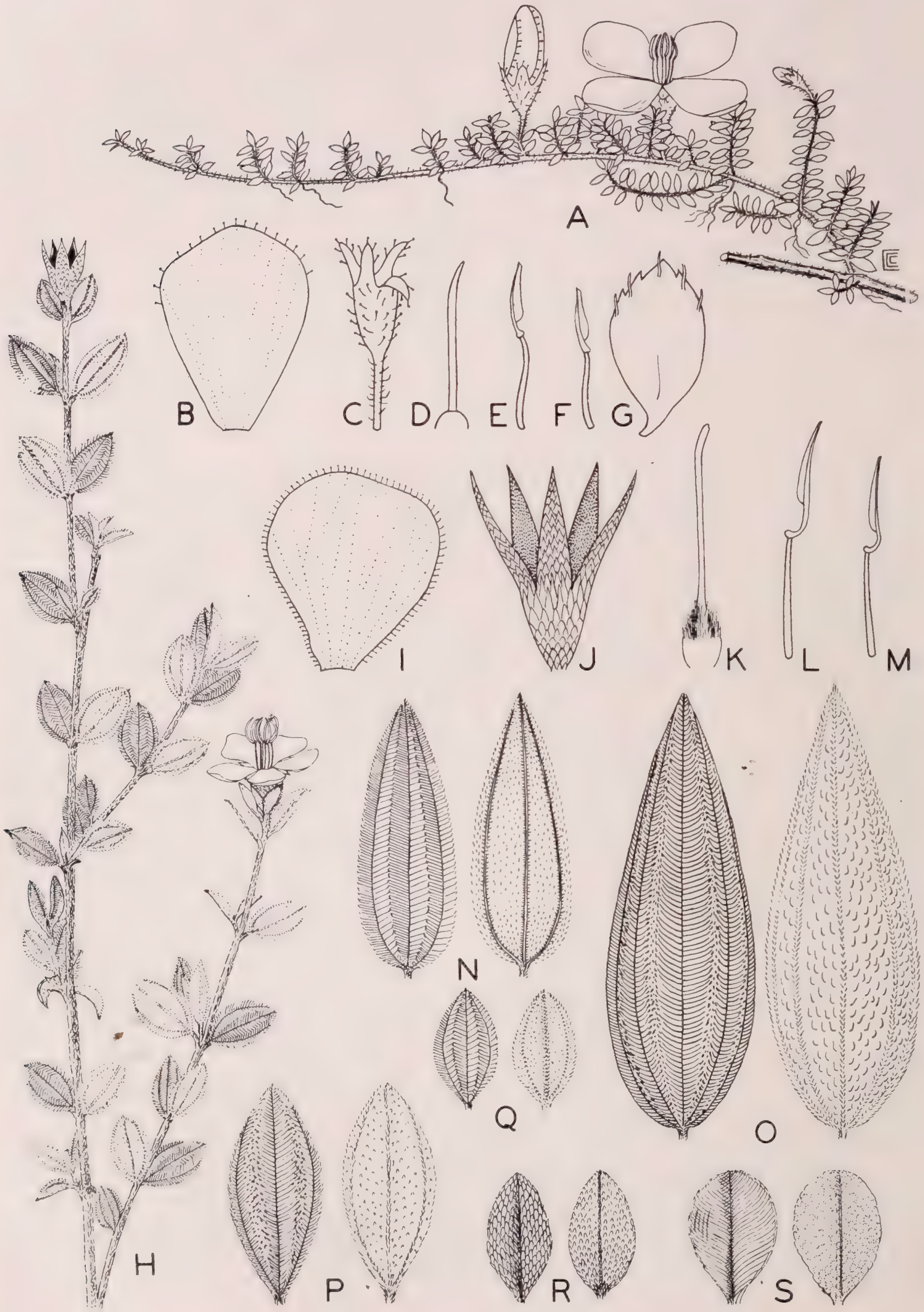


FIG. 11. a–g, *Comolia serpyllacea*. a, habit, × 1; b, petal, × 2; c, hypanthium and calyx, × 2.5; d, pistil, × 2.5; e f, large and small stamens, × 3; g, leaf, × 5. h–m, *Tibouchina dissitiflora*. h, habit, × 0.5; i, petal, × 1.5; j, hypanthium and calyx, × 1.5; k, pistil, × 1.5; l–m, large and small stamens, × 1.5. n–s, upper and lower leaf surfaces of *Tibouchina* spp.

eciliate. Stamens slightly to markedly anisomorphic, the larger antesepaler. Anthers linear-subulate, arcuate, 1-pored; connective prolonged below the thecae into a bilobed ventral appendage, with a dorsal caudal appendage on the connective between the thecae and filament insertion. Ovary free, 4-locular, multiovulate, glabrous or apically puberulous or setose; style thin, long-exserted; stigma punctiform. Fruit capsular, the hypanthium smooth or 8-costate; capsule 4-locular; seeds cochleate, strongly muriculate.

Generotype: *P. coriaceum DC.*

Key to the Species of *Pachyloma*

Leaf-surfaces glabrous; apex of the ovary glabrous (rarely sparsely puberulous).
  Leaf-margins strongly incrassate; leaves notably 5-nerved. 1. *P. coriaceum.*
  Leaf-margins not thickened; leaves mostly 3-nerved, occasionally faintly 5-nerved. 2. *P. huberioides.*
Leaf-surfaces conspicuously glandular-setulose; apex of the ovary densely coronate-setulose with long glanduliferous hairs. 3. *P. setosum.*

1. **Pachyloma coriaceum** DC. Prodr. **3:** 123. 1828.

P. coriaceum var. *α glaberrima* DC. Prodr. **3:** 123. 1828.
P. coriaceum var. *β subsetosum* DC. Prodr. **3:** 123. 1828.
Rhexia pachyloma Schr. & Mart. ex DC. Prodr. **3:** 123. 1828. Nomen.
Rhexia bicuspis Schr. & Mart. ex DC. Prodr. **3:** 123. 1828. Nomen.
Rhexia amazonum Schr. & Mart. ex DC. Prodr. **3:** 123. 1828. Nomen.
Heteronoma pachyloma Mart. Nov. Gen. Sp. **3:** 140. pl. 273. 1829.

Shrub, the terete to obscurely quadrangular branches glabrous. Petioles 3–10 mm, glabrous; leaf-blade 5–10 × 2–5.5 cm, oval to ovate-oval, the apex short-acuminate, the base rounded to subcordate, the margins notably incrassate and recurved, entire or evanescently serrulate, 5-nerved, the nerves narrowly impressed above and prominulous-incrassate below, the secondary nervation narrow and rather obscure, obscurely punctate beneath at maturity, glabrous. Pedicels 0–12 mm below the bracteoles, 1–3 mm above, the early-caducous bracteoles oblanceolate and 1–3 × 0.5–1 mm. Hypanthium (6–) 8–11 mm long, long-campanulate, the fleshy deltoid to rounded calyx-lobes 0.5–1 mm long. Petals 15–20 × 8–9 mm, ovate to elliptic, short-acuminate, seto-mucronulate. Stamens glabrous, the filaments 7.5–11.5 mm long antesepalous stamens with thecae 10–12 mm long, the connective prolonged 0.6–3.5 mm to the filament insertion, the ventral acute spurs 0.2–0.5 mm long, the dorsal seta 1.8–2.2 mm long; alternisepalous stamens with thecae 9.5–11.5 mm long, the connective prolonged 0.4–0.7 mm to the filament insertion, the ventral acute spurs 0.6–1 mm long, the dorsal seta 1–1.4 mm long. Style 16–17 mm long, glabrous or sparsely glandular-setulose; ovary glabrous.

Type Collections: *Martius s. n.* "Prov. R. Negro" (M, holotype of *P. coriaceum* and *Rhexia pachyloma*); *Martius s. n.* "Prov. Para" (M, holotype of *P. coriaceum* var. *glaberrima* and *Rhexia bicuspis*); *Martius s. n.* "Ararocoara" (M, holotype of *P. coriaceum* var. *subsetosa* and *Rhexia amazonum*).

---

n. *T. spruceana* (*Maguire, Wurdack, & Bunting 36136*), × 1; o, *T. aspera* (*Maguire & Maguire 40461*), × 1; p, *T. fraterna* (*Maguire & Fanshawe 32508*), × 1; q, *T. dissitiflora* (*Maguire, Wurdack, & Bunting 37053*), × 1; r, *T. duidae* (*Cowan & Wurdack 31202*), × 1; s, *T. sipapoana* (*Maguire & Politi 28466*), × 2.

Additional Material: COLOMBIA: Vaupés: Cerro Yapobodà, Río Kuduyari, *Schultes & Cabrera 14249* (NY, US); Cerro Kañendá, Río Kubiyú, *Schultes & Cabrera 18339* (NY, US), *18389* (US); Mesa de Yambí, Río Karuru, *Schultes & Cabrera 19127* (NY, US); Río Paraná Pichuna, *Schultes & Cabrera 19927* (NY); Río Vaupés, Mitu, *Humbert 27324* (P).

The Munich specimens apparently were never annotated by Cogniaux or Triana. None of the sheets bear de Candolle annotations but perhaps were seen by him before being mounted. All three Munich sheets bear Schrank diagnosis slips, although the diagnosis attached to the "*Rhexia bicuspis*" sheet is for *Leandra quinquenodis* (DC.) Cogn. Drs Baehni and Weibel supplied the information that there is only one herbarium sheet of *Pachyloma* in the de Candolle herbarium, with a packet containing leaves and a flower along with a label written by A. P. de Candolle "*Rh. pachyloma* L. Bresil M. Martius 1827"; two other labels, not attached to any plants and not in de Candolle's script, bear brief French diagnoses of "*R. amazonum α ovatae*" and "*R. amazonum β lancifolia.*"

Baehni and Weibel also supplied the following information: Martius kept up a close correspondence with A.-P. de Candolle and called him "my dear friend." In one of his letters to DC., dated March 13, 1827, he wrote; "Je viens de vous envoyer par la messagerie le second cahier du 2^{e} volume de mes Nova Genera." There is one thing of great interest in the *Memoires et souvenirs de Augustin-Pyramus de Candolle* (issued in 1862). De Candolle says that he went to Munich in Fall 1827 to attend a meeting of the German men of sciences; he was received there with great kindness by M. de Martius; he writes (p. 377): "Pendant les quelques jours que j'y ai passés, j'avais vu les portions de l'herbier de Martius relatives aux familles dont je m'occupais pour le troisième volume du Prodromus."

The single-branch stamen dimorphism in the Schules & Cabrera collections is marked. Markedly dimorphic antesepalous and alternisepalous stamens are found on *14249* (NY), *18339* (NY), *18389* (US), and *19127* (NY). Subisomorphism is seen in *14249* (US) and *18339* (US). The NY sheet of *19927* has one isomorphic branch and a separate anisomorphic branch. An unmounted US sheet of *18339* has dimorphic stamens but nearly glabrous hypanthium and glabrous style; the NY sheet of this number has moderately glandular hypanthia and glandular styles. The hypanthial and pedicellar glandulosity is so variable that there seems to be no reason for maintaining De Candolle's varietal distinctions. On two of the Martius sheets at Munich, long connective prolongations are visible; the sheet of *P. coriaceum* var. *glaberrimum* now has no intact stamens.

2. **Pachyloma huberioides** (Naud.) Triana, Trans. Linn. Soc. **28:** 64. 1871.

Urodesmium huberioides Naud. Ann. Sci. Nat. III. **15:** 338. 1851.
Pachyloma scandens Ducke, Arch. Inst. Biol. Veg. Rio **2:** 65. 1935.

Weak shrub 0.5–2.5 m, the terete branches glabrous. Petioles 2–8 mm, glabrous; leaf-blade 4–10 × (0.6–) 1–5 cm, lanceolate to ovate-elliptic, the apex acuminate, the base rounded to subcordate, the margins obscurely to notably denticulate when young (obscurely so with age) and not incrassate (the blade otherwise glabrous), 3-nerved or weakly 5-nerved, the nerves impressed above and prominulous below, the secondary nervation obscure to finely prominulous, sparsely punctate beneath at maturity. Pedicels 0.6–12 mm long below the bracteoles, 1–3 mm above, the caducous linear to oblanceolate bracteoles glabrous or sparsely glandular-setulose. Hypanthium 6–12 mm long, suburceolate to long-campanulate, glabrous to sparsely glandular-setulose, the fleshy deltoid to rounded calyx-lobes about 1 mm long and usually sparsely glandular-setulose. Petals 15–20 × 8.5–9.5 mm, ovate to ovate-oval, acute, mucronulate. Stamens usually glabrous, the filaments 7.5–13 mm long; antesepalous stamens with thecae 8.5–13 mm long, the connective prolonged 1–3.5 mm to the filament insertion, the ventral acute spurs 0.4–1 mm long, the dorsal seta 2.5–7 mm long; alternisepalous stamens with thecae 9–11.5 mm long, the connective prolonged 0.5–0.9 mm to the filament insertion, the ventral acute spurs 1–2 mm long, the dorsal seta 2.5–4.5 mm long. Style 15–27 mm long, glabrous; ovary glabrous or sparsely glandular-puberulous. Seeds 0.9 × 0.6 mm, the tubercles about 0.06 mm high.

Type Collection: VENEZUELA: Río Atabapo near San Baltazar, *Bonpland 936* (Holotype and isotype, P).

Additional Material: VENEZUELA: Amazonas: Caño Cupaven, Río Orinoco near mouth of Río Atabapo, *Level 68* (NY); Yapacana savannas, *Maguire, Cowan, & Wurdack 30579* (NY), *Maguire, Wurdack, & Bunting 36609* (NY); Sabana Grande, Esmeralda, *Maguire & Wurdack 34690* (NY); Caño Pimichín sabanita near Pimichín, *Maguire, Wurdack, & Bunting 36390* (NY); savanna on right bank of Río Pacimoni 50 km above mouth, *Maguire, Wurdack, & Bunting 37558* (NY). BRAZIL: Amazonas: lower Rio Curicuriary, *Ducke H.J.B.R. 24105* (isotypes of *P. scandens*, P, US); Rio Negro, Uanauaca, *Froes 22329* (IAN, NY, U).

The collections *36609* and *36390* are fruiting only; I have been unable to find any ovarial pubescence in collections other than these two, even in one available fruiting branch of *34690*. Of all the recent collections, *Level 68* is the best match for the holotype. In part of *34690*, the filaments apically have a few glandular hairs. Flower size varies greatly within the cited specimens. *Ducke 24105*, *MWB 37558*, and *Froes 22329* have approximately isomorphic stamens. *MW 34690* has quite anisomorphic stamens, while *Level 68* has considerable variability (with generally anisomorphic stamens).

3. **Pachyloma setosum** Wurdack, sp. nov.

A congeneribus differt foliorum superficie glanduloso-setosa, ovarii apice setoso-coronato setis glanduliferis.

Frutex 0.2–2 m; rami congesti teretes cum petiolis pedunculis pedicellisque modice persistenterque glanduloso-setosi. Petioli 2–4 mm; lamina 3–8.5 × 1.5–3.5 cm, ovalis apice rotundata mucronulata basi rotundata trinervia vel nervis duobus obsoletis inframarginalibus additiciis; nervis primariis supra anguste impressis subtus prominentibus, nervis secundariis inconspicue evolutis, supra sparse conspicueque glanduloso-setosa setis ad 4 mm longis glandulis caducis, subtus sparse glanduloso-setosa praecipue ad nervos superficie cum glandulis sessilibus 4–6/mm^2 ornata, marginibus glanduloso-setosis. Inflorescentia terminalia e dichasiis paucis composita; pedicelli 1–13 mm infra bracteolas, 1–3 mm supra; bracteolae caducae oblanceolatae vel lineares 1.1–3 × 0.5–1.5 mm, glanduloso-ciliolatae. Hypanthium cylindrico-campanulatum 9–10 mm longum conspicue glanduloso-setosum calycis lobis obtusis inconspicuis. Petala 16.5–17 × 11.5–12 mm, ovalia apice breviter cuspidata extus apicem versus persparse glanduloso-setosa. Stamina isomorphica; thecae 10–11 mm longae, connectivo sub loculis 1 mm protracto appendicibus ventralibus acutis 1.5 mm longis, seta dorsali 3.5–4 mm longa, paulo supra insertionem filamenti inserta, filamento 9 mm longo glabro. Stylus 16–17 mm longus, glaber; ovarium 6.5 mm altum, apice setis multis glanduliferis coronatum; hypanthium fructiferum 15 × 10 mm obtuse 8–costatum; semina 1 × 0.9 mm cochleata valde muriculata.

Type: sabanita 1 km west of Maroa, elev. 130 m, Río Guainía, Terr. Ama-

zonas. Venezuela, Nov 25, 1953, *Bassett Maguire, John J. Wurdack, & George S. Bunting 36397* (NY). Paratypes: same locality, frequent shrub, petals magenta, filaments white except for pink stripe just below anthers, April 17, 1953, *Maguire & Wurdack 35717.*

Adelobotrys fruticosa Wurdack, sp. nov.

A. barbatae Tr. affinis sed foliis plerumque minoribus foliorum indumento subtus densissimo appresso inflorescentia non pedunculata calycis dentibus maioribus.

Rami juveniles dense rufo-villosi demum cinerei glabrati. Petioli lati, 3–10 mm longi; lamina 4–11 × 2–4.5 cm, elliptica apice acuta basi obtusa vel truncata 5–7-nervia nervis primariis supra et subtus leviter elevatis nervis secundariis supra paulo elevatis subtus obscuris, supra primum villosula demum glabrata, subtus densissime strigulosa setis gracillimus primum rufescentibus demum cinereis tarde in lamellis irregularibus dehiscentibus; folia demum deflexa. Inflorescentia capitata sessilis vel maxime ad 1 cm pedunculata in toto cum pedicellis hypanthiis calycibusque densissime rufo-strigosa pilis gracilibus. Flores 5-meri breviter (ad 5 mm) pedicellati, alabastris submaturis solum notatis. Hypanthium 6 × 4 mm; calyx ad basim 1 mm coalitus, lobis ovatis 2.5 mm longis, dente exteriore 1.2 mm longo acuto. Petala late obovata obtusa. Stamina dimorphica, maioribus cum antheris 4.7 mm longis, connectivi basi acuta 0.8 mm producta appendice dorsali adscendenti 2.5 mm longa, apice breviter emarginata, minoribus cum antheris 2.6 longis, connectivi basi acuta 0.6 mm producta appendice dorsali adscendenti 2.5 mm longa apice rotundata. Ovarium 3-loculare glabrum apice truncatum.

Type: shrub 0.3–1.5 m, frequent in sabanita on right bank of Caño Pimichín 1 km above Pimichín, elev. 140 m, Río Guainía, Terr. Amazonas, Venezuela, Nov 24, 1953, *Bassett Maguire, John J. Wurdack, & George S. Bunting 36392* (NY). Paratype: infrequent in woodland near Savanna No. 1, northwest base of Cerro Yapacana, elev. 125 m, Río Orinoco, Terr. Amazonas, Venezuela, Nov 20, 1953, *Maguire, Wurdack, & Bunting 36608.*

A. barbata has leaves with petioles 1.5–3 cm long and blades up to 20 × 8 cm; the lower leaf-surfaces are moderately covered with stout semi-erect malpighian hairs; the inflorescence is a short but definite panicle and the calyx proper is only indistinctly lobed. *A. barbata* is known from Maroa, Venezuela, and the upper Río Negro drainage (Rios Vaupes, Piraparana, and Içana).

Adelobotrys duidae (Gleason) Wurdack, comb. nov.

Meriania duidae Gleason, Bull. Torrey Club **58**: 419. 1931.

The umbellate inflorescence and fine brown cauline pubescence make this species much more congruous with *Adelobotrys*, where the nearest relatives, *A. fructicosa* Wurdack and *A. barbata* Tr., are also both shrubs in a predominantly vining genus. The persistent pubescence of the upper leaf-surface and the non-projecting exterior calyx-teeth immediately distinguish *A. duidae;* the species is known only from the cumbres of Cerros Duida and Huachamacari.

Graffenrieda hitchcockii Gleason var. **parvifolia** Wurdack, var. nov.

A var. *hitchcockii* differt foliis minoribus ovatioribus subtus subglabratis. Paniculae angustiores cum floribus paucioribus.

Type: shrub or small tree 3 m high, petals white, stamens yellow, occasional

near Camp Yutaje, elev. 1300 m, Cerro Yutaje, Terr. Amazonas, Venezuela, Feb 6, 1953, *Bassett Maguire & Celia K. Maguire 35073* (NY).

Paratypes (all from Terr. Amazonas, VENEZUELA): Cerro Yutaje, *Maguire & Maguire 35091, 35232;* Cerro Coro-Coro, *Maguire & Maguire 35489;* Cerro Guanay, *Maguire, Phelps, Hitchcock, & Budowski 31730.*

Var. *hitchcockii* has nearly elliptic leaf-blades mostly 12–25 × 9–13 cm with rather persistent reddish puberulence; the floriferous parts of the panicles are 10–21 × 10–15 cm. It is represented, apart from the type collection, by *Maguire & Maguire 35338 and 35360* (both from Yutaje). Var. *parvifolia* has ovate-elliptic leaf blades 7–10 (–14) × 3–6 (–9) cm with acute to acutely rounded apices; the pubescence of the lower leaf-surface is chiefly confined to the nerves; and the flowering panicles are 7–13 × 5–7 cm, expanding up to 20 × 9 cm in fruit. The flowers of both varieties are either 4- or 5-merous; the ovary is predominantly 3-celled, rather than 4-celled as originally described.

Graffenrieda rufa Wurdack, sp. nov.

G. hitchcockii Gl. remote affinis sed foliis minoribus acuminatis.

Ramulorum novellorum petiolorum foliorum novellorum alabastrorumque pubescentia rufescentia densa granulosa. Petioli 8–15 mm; lamina integra 3.5–6.5 × 2–4 cm, ovata apice breviter gradatimque acuminata basi paulo cordata 5-nervia, nervis secundariis supra inconspicue impressis subtus paulo elevatis, supra et subtus primum dense granuloso-puberula, supra demum glabrata et nitidula, subtus demum persistenter dense subtiliterque cinereo-furfuracea. Inflorescentia terminalis pluriflora; alabastra elliptica apice hebetiacuta 5-mera. Staminum connectivum postice cum appendice acuta antice exappendiculatum. Ovarium 3-loculare, dense granulosum apice in collum breve protractum. Fructus 1–2 mm pedicellatus; fructuum sepala (vel dentes exteriores ?) ca. 2 mm longa, acuta; hypanthium fructiferum 4–4.5 × 3.5 mm; semina pyramidata laevia 0.7–0.8 × 0.3 mm.

Type: shrub to 4 m, in bud, rare in cumbre between between Summit Camp and southwest escarpment, elev. 1850 m, Cerro Huachamacari, Terr. Amazonas, Venezuela, Dec 17, 1950, *Bassett Maguire, R. S. Cowan, & J. J. Wurdack 30282* (NY).

Paratypes (all Terr. Amazonas, VENEZUELA): shrub or small tree to 5 m, inflorescence tawny, frequent in cumbre of Cerro Huachamacari, elev. 1700 m, Dec 4, 1950, *Maguire, Cowan, & Wurdack 29817;* shrub 5–8 ft tall, leaves dark green above, rufous brown below and on petioles and young stems, moist exposed cliff face at 1600 m elev., southeastern-facing sandstone bluffs near Caño Negro (tributary of Caño Iguapo), Cerro Duida, Aug 26, 1944, *J. A. Steyermark 58044.*

Graffenrieda fruticosa Wurdack, sp. nov.

G. rufae Wurdack remote affinis, sed foliis minoribus triplinerviis non acuminatis venis secundariis subtus vix evolutis, inflorescentia vix evoluta.

Ramuli novelli cum petiolis foliis subtus hypanthio calyceque densissime pallideque rufo-fulvi. Petioli 4–9 mm; lamina integra 10–25 × 6–10 mm (in ramis sterilibus ad 40 × 20 mm) elliptica vel paulo ovato-elliptica apice hebetiacuta basi late acuta breviter (0.5–1 mm) triplinervia nervis secundariis inconspicuis supra anguste insculptis, supra primum furfuracea demum glabrata, subus primum pallide rufo-fulva demum cinerea. Flores in ramulis foliosis plerumque terni sessiles vel vix (ad 1 mm) pedicellati 5–6- (raro 4-) meri. Hypanthium (ad torum) 3.7–4.7 × 3–4 mm.; calyx 1.4–2.8 mm coalitus ad

apicem vix (ad 0.8 mm) lobulatus, cum dentibus exterioribus 1.5–2.5 × 0.8–1 mm lanceolatis instructus. Petala 12–14 × 5–9 mm, asymmetrice obovata apice obtusa eciliata intus glabra extus modice granuloso-furfuracea. Stamina glabra isomorphica; filamenta 3.7–4.8 mm; antherae subulatae curvatae 4–4.8 mm longae, connectivo sub thecis paulo (ad 0.4 mm) producto postice in calcar acutum 0.8–1 mm longum porrecto. Stylus glaber 8.2–11.3 × 0.5 (basi) –0.2–0.3 (apice) mm; ovarium 3-loculare, dense rufo-granulosum apice in collum integrum 1 mm. longum prolongum; semina 0.6–1 × 0.3–0.45 mm, laevia pyramidata.

Type: shrub 0.2–0.7 m, petals pink, anthers yellow, occasional in savanna 5 km west of cumbre camp, elev. 1900 m., Cerro de la Neblina, Terr. Amazonas, Venezuela, Jan 6, 1954, *Bassett Maguire, John J. Wurdack, & George S. Bunting 37105* (NY). Paratypes (all from the west cumbre of Neblina): *Maguire, Wurdack, & Bunting 36927, 37085, 37295.*

The long exterior calyx-teeth are reminiscent of the genus *Meriania;* however, the character of the pubescence and the granulose ovaries indicate *Graffenrieda. G. fruticosa* seems to be the ultimate reduction of a line coming from *G. hitchcockii* Gleason through *G. rufa* Wurdack.

Graffenrieda reticulata Wurdack, sp. nov.

G. fantasticae Schult. & Sm. affinis et in habitu similis, sed foliis trinerviis nervulis bene reticulatis fructibus maioribus.

Arbor parva, ramis crassis paulo quadrangularibus (cum cortice laevi sulcato) primum rufo-squamulosis mox glabratis. Petioli 1–1.5 cm; lamina glabra 6–10 × 3–6 cm, elliptica, apice rotundata vel paulo retusa, basi late acute vel anguste obtusa. trinervia nervis lateralibus maxime 4–8 mm a marginibus distantibus, nervulis supra obscuris subtus leviter elevatis secundariis numerosis tertiaris bene reticulatis. Panicula glabra; flores sessiles cum characteribus generis; alabastra 4-mera, ovario 3-loculari apice rotundato glabro. Fructus urceolatus 3-locularis ca. 8 × 4 mm ad torum ad 2.5–3 mm constrictus, calyce vix lobato.

Type: tree 5–10 m, fruiting, common in scrub forest between cumbre camp and west escarpment, elev. 1700-1750 m, Cerro de la Neblina, Terr. Amazonas, Venezuela, Jan 13, 1954, *Bassett Maguire, John J. Wurdack, & George S. Bunting 37253* (NY). Paratype: bushy tree 3–8 m, buds greenish, occasional in uppermost slope forest above Camp 4, elev. 1600-1700 m, Cerro de la Neblina, Jan 13, 1954, *Maguire, Wurdack, & Bunting 37268.*

G. fantastica has 5- or indistinctly 7-nerved leaves with the tertiary veins not obvious and an ovoid fruit less than 5 mm long. The paratype collection of *G. reticulata* had buds sufficiently advanced to establish the genus and flower-mery definitely.

Graffenrieda sessilifolia Triana subsp. **occidentalis** Wurdack, subsp. nov.

A subsp. *sessilifolia* differt petalis roseis ovario apice in collum ca. 1 mm longum protracto.

Type: shrub or small tree 2–10 m, petals pale pink, anthers pale yellow, occasional among boulders on hillside, elev. 1750 m, Cerro Yutaje, Terr. Amazonas, Venezuela, Feb 17-19, 1953, *Bassett Maguire & Celia K. Maguire 35289* (NY).

Paratypes (all VENEZUELA, Terr. Amazonas): tree 5 m high, petals pink, anthers yellow, frequent in scrub bush among boulders above Intermediate Camp, elev. 1200 m, Cerro Yutaje, Feb 4, 1953, *Maguire & Maguire 35052;* shrub 2 m high, flowers pink, occasional on summit of Cerro Yutaje, elev. 2200 m, Feb 17–19, 1953, *Maguire & Maguire 35331;* small tree with subcoriaceous shining leaves, petals pink, anthers pale yellow, frequent in subxerophytic

low bush on northwest ridge above Camp Yutaje, elev. 1500 m, Cerro Yutaje, Feb 23, 1953, *Maguire & Maguire 35399;* tree 2–4 m high, petals pink, occasional on rocks, elev. 1500 m, Cerro Coro-Coro, March 2, 1953, *Maguire & Maguire 35464;* shrub 3 m, flowers pink with yellow centers, Cerro Yavi, elev. 2200 m, March 1–3, 1947, *K. D. Phelps & C. B. Hitchcock 55.*

Typical *G. sessilifolia,* as represented on Roraima, Ilu-tepuí, Ptari-tepuí, and Chimantá-tepuí, has white petals and ovary apex truncate without collar. On Auyan-tepuí exists still another population with pink petals, persistent pubescence on the lower leaf-surface, and truncate ovary apex; this subspecies will be described at a later date. *G. sessilifolia* is quite variable in leaf size and degree of leaf venation development; the ovary and fruit may be either 2- or 3-celled.

Bertolonia venezuelensis Wurdack, sp. nov. Figure 12, b-f.

A congeneribus differt antheris basi postice non distincte calcaratis.

Caulis repens (raro vix erectus) cum petiolis dense rufo-tomentosus pilis gracilibus flexuosis 1–2 mm longis (ad nodos ad 5 mm longis). Folia in caulibus repentibus alterna jugi uno suppresso (in caulibus raris erectis opposita); petiolus plerumque 4–8 cm; lamina 6–18 × 3–6 cm, ovata apice per 1–2 cm caudato-acuminata basi late acuta vel truncata margine integra vel paulo irregulariterque undulata (acumine plerumque distincte pinnatilobulato) breviter 7-plinervia (nervos marginales includens) nervis interioribus 2–10 et 5–17 mm supra basim insertis nervulis supra obscuris subtus leviter distincteque elevatis, supra modice strigulosa pilis gracillimis 5–8 mm^2 ca. 1 mm longis pallidis, subtus in superficie glabra in nervis primariis densissime rufo-strigosa (pilis ut in caulibus) in secundariis modice strigulosa tertiariis glabris sed cum glandulis pallidis clavatis armatis. Pedunculus communis erectus (ad ramos 10–15 cm) primum modice rufo-strigulosus demum subglabratus, ca. medium cum nodo; rami plerumque umbellati ad anthesim 2–3 cm longi secundiflori ad nodos bibracteolati, bracteola sessili submillimetrali basi cum glandulis duobus nigris globosis sessilibus subtenta. Pedicelli 2–4 mm cum hypanthio sparse strigulosi pilis gracilibus ca. 0.1–0.2 mm longis. Flores 5-meri. Hypanthium 1.7 (ad torum) × 2.5 mm; calyx 0.4 mm coalitus, lobis 0.8 × 2.2 mm, basim versus paulo imbricatis late ovatis apice truncatis extus tuberculato-dentatis dente ca. 1 mm longo non vel vix projecto. Petala 9.5–10 × 7.5–8.5 mm obovata vel subrotundata paulo asymmetrica apice rotundata glabra eciliata. Stamina isomorphica; filamenta 3.2–3.7 mm longa; antherae 2.7–3.2 mm longae paulo subulatae, connectivo exappendiculato sub loculis imperspicue (0.1–0.15 mm.) producto. Stylus 5–5.5 × 0.2–0.3 mm.; stigma punctiforme; ovarium triloculare triquetrum glabrum apice in lobulos tres obtusos carnosos 0.6 mm altos extensum.

Type: prostrate herb, petals very pale pink inside, darker without, stamens yellow, locally frequent on escarpment slopes east of Camp 3, elev. 1600 m, Cerro de la Neblina, Terr. Amazonas, Venezuela, Jan 24, 1954, *Bassett Maguire, John J. Wurdack, & George S. Bunting 37370* (NY). Paratypes (same locality): Dec 27, 1953, *Maguire, Wurdack, & Bunting 36951, 36947.*

B. venezuelensis represents the first record for the genus outside of southeastern Brazil. In habit, the Neblina species agrees quite well with several Brazilian species, but the combination of densely rufous-pilose stems and pubescent acuminate leaves are sufficient vegetative distinctions. The connective being not at all prolonged into a dorsal calcar (albeit prolonged slightly below the thecae to the filament insertion) seems unique.

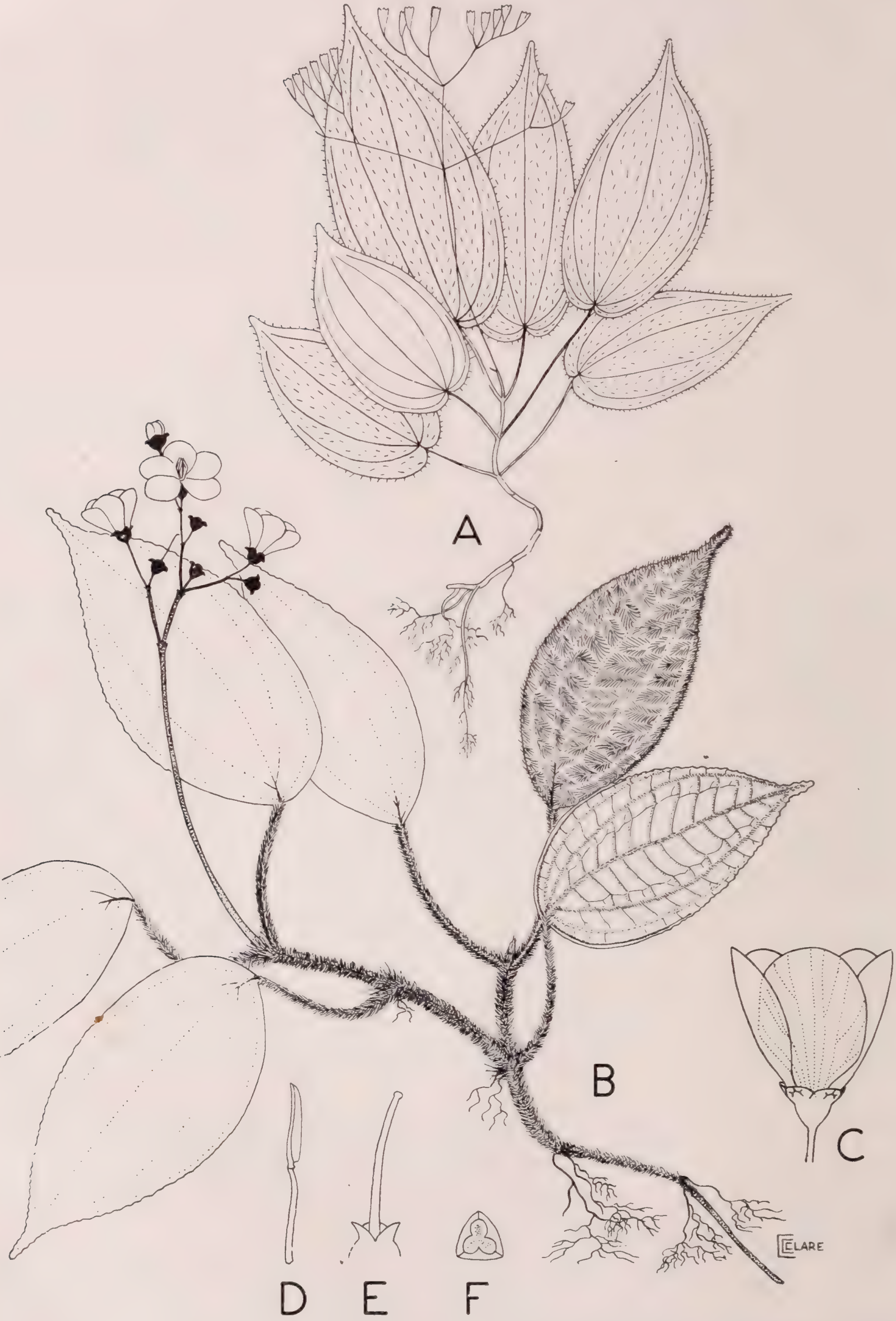


FIG. 12. a, *Macrocentrum gracile*, habit, × 0.5. b–f, *Bertolonia venezuelensis*. b, habit, × 0.5; c, flower, × 4; d, stamen, × 2; e, pistil, × 2; f, ovary top view, × 2.

Macrocentrum gracile Wurdack, sp. nov. Figure 12, c.

M. fruticoso Gleason affinis sed foliis maioribus et tenuioribus basi distincte cordatis pedicellis longioribus petalis minoribus connectivo antherarum dorsali minore.

Plantae herbaceae suberectae, caulibus ad 30 cm longis, quadratis vel sub-4-alatis glabris. Folis opposita in quoque jugo aequalia vel subaequalia; petiolus 2.8 cm, glaber; lamina tenuissima 4–12 × 3–7 cm, ovata vel oblongo-ovata, apice breviter (ca. 1 cm) hebetiacuminata, basi breviter (ad 1 cm) cordata lobis basilaribus plerumque imbricatis, 5–7-nervia nervis primariis gracilibus secundariis indistinctis, ad marginem integra vel vix denticulata ciliata ciliis patentibus ca. 1–2 mm longis et 1–2 mm inter se distantibus, supra sparse strigosa pilis gracilibus 1–2 mm longis 0.5–3 mm^2, subtus in superficie venisque primariis glabra in venulis (praecipue marginem versus) sparsissime strigulosa. Inflorescentia laxa glabra pedunculo gracili 6–8 cm longo ramis primariis umbellatis plerumque 2–3 usque 4 cm longis, ramulis umbellatis 3 vel 4 in quoque ramo 1–3 cm longis 2–4-floris. Flores secundi 4-meri glabri; pedicelli graciles, 5–10 mm. longi. Hypanthium 3 × 1.2 mm; calyx vix (0.1–0.2 mm) coalitus, lobis 0.4 × 0.9 mm late triangularibus obtusis extus cum dente 0.4 mm longo vix (0.2 mm) projecto armatis. Petala 3.6 × 1.4 mm anguste obovata acuta. Stamina isomorphica; filamenta 1.8 mm longa; antherae loculi 2.5 mm longi, apice attenuati, connectivo sub loculis ad insertionem filamenti non producto sub filamento dorsaliter in caudam 0.4 × 0.1 mm hebeti-acutam producto. Ovarium biloculare; stylus 4.5 × 0.1 mm; stigma punctiforme; semina 0.28 × 0.2 mm, ovoidea unilateraliter truncata minute tuberculata.

Type: delicate annual with white flowers, infrequent under overhanging rocks on summit of southeast-facing escarpment, elev. 700 m, Mt. Ebeni, British Guiana, Oct 15, 1951, *Bassett Maguire 32117* (NY).

M. fruticosum has smaller thicker leaf-blades with usually truncate bases, pedicels only 1–3 mm long, petals 7–7.5 mm long, and larger anthers with relatively longer dorsal appendage.

Macrocentrum stipulaceum Wurdack, sp. nov.

M. parvulo Gleason affinis sed foliis plusminusve acuminatis distincte denticulatis, ramulis ad nodos cum processibus reniformibus stipulaceis armatis.

Herba parva ad 15 cm alta, caulibus glabris. Folia opposita aequalia vel paulo inaequalia; petiolus gracilis glaber 5–15 mm, cum processu reniformi stipuliformi sparse glanduloso-strigoso 1–2 × 1.3–2.5 mm subtentus processibus subpersistentibus 2 (–3?) per nodum; lamina tenuissima 15–40 × 10–20 mm, ovata apice gradatim hebeti-acuminata basi paulo (1–3 mm) cordata, 3–5-nervia, ad margines obtuse denticulata dentibus ca. 0.1 mm altis 1–2 mm inter se distantibus in dentis sinu ciliata ciliis gracilibus 0.5–1 mm longis, supra et subus sparse strigulosa setis gracilibus ca. 1 mm longis ca. 1/mm^2 praecipue praeter venas venulasque. Pedunculi terminales 1–3 cm longi, glabri, 1- vel plerumque 2-flori. Flores ignoti; pedicelli fructuum ca. 5 mm longi. Hypanthium (ad torum) ca. 4.5 mm longum paulo 8-venosum; calycis lobi interiores quattuor obtusi, ca. 0.7 ×1.3 mm, dente exteriore acuto ca. 0.4 mm projecto, setis paucissimis glanduloso-capitatis ad 1 mm longis extus in calycis lobis notatis. Semina cum aspectu *M. gracilis,* ca. 0.8 × 0.6 mm, minute tuberculata.

Type: delicate annual, locally frequent in dry places under overhanging rocks on montane slopes of Mt. Ayanganna, elev. 1000–1500 m, British Guiana,

Feb 5–6, 1955, *Bassett Maguire, W. M. C. Bagshaw, & Celia K. Maguire 40582* (NY).

M. parvulum has shorter stems, obtuse to subacute leaf-blades with obtuse to broadly acute bases, and no stipuliform cauline appendages. The leaf shape, lack of stipules, and many-flowered inflorescences will distinguish *M. montanum* Gleason and depauperate specimens of *M. cristatum* Tr. and *M. fruticosum* Gleason.

Macrocentrum longidens (Gleason) Wurdack, comb. nov.

Diolena longidens Gleason, Mem. N. Y. Bot. Gard. **8**: 140. 1953.

Macrocentrum repens (Gleason) Wurdack, comb. nov.

Diolena repens Gleason, Bull. Torrey Club **75**: 541. 1948.

For both these taxa I have now been able to examine buds sufficiently mature to show the stamen structure. The affinity of both with the next-described species is evident, in aspect as well as in floral details; all three have a ciliate short ovarial collar, the same type of anther and stamen appendages, and the same kind of hypanthial pubescence. These transfers eliminate the genus *Diolena* from the Guayana Highland flora. *M. repens* is now also known from the slopes of Ptari-tepuí (*Steyermark 59461, Maguire & Wurdack 33928*) and from Mt. Ayanganna (*Maguire, Bagshaw, & Maguire 40584-A*).

Macrocentrum neblinae Wurdack, sp. nov.

M. longidenti (Gleason) Wurdack valde affinis sed plerumque robustius, foliis maioribus in proportione angustioribus apice anguste acutis sepalorum lobis interioribus ovatis hebeti-acutis.

Herba basi lignosa alt. ad 60 cm superne ramosa, ramis teretibus glabris. Folia opposita in quoque jugo valde dimorphica primum cum glandulis pallido-rubris sparse ornata demum marginibus exceptis glabra; folia minora sessilia ovate acuta ad 8 × 3 mm uninervia margine sparse denticulato-ciliata; folia maiora brevipetiolata (petiolo plerumque ca. 1 mm longo) 2–4 × 0.5–1.3 cm, lanceolata apice acute basi cuneata paulo (0.5–1 mm) triplinervia, marginibus de medio apicem versus sparse denticulatis, denticulis 1–2 mm inter se distantibus uniciliatis cilio appresso. Flores 5-meri solitarii, pedicello ca. 2–3 mm longo, dense glanduloso-puberulo basi bibracteolato bracteolis lanceolatis glabris. Hypanthium (ad torum) 2–2.8 × 2.2–2.7 mm modice glanduloso-puberulum pilis ca. 0.5 mm longis. Calyx vix (0.2 mm) coalitus, lobis interioribus 2–2.5 × 1.6–1.9 mm, ovatis hebeti-acutis sparse glanduloso-puberulis margine glanduloso-ciliolatis, dentibus exterioribus aristatis arista 2–2.5 mm eminenti (in fructu ad 3 mm) basim versus parce glanduloso-scabridula. Petala (paulo immatura) 4.7 × 2.7 mm ovata acuta breviapiculata glabra. Stamina inconspicue dimorphica; filamenta matura desunt; antherae 2.6 mm longae, basi 0.5 mm latae, paulo subulatae poro 0.2 mm lato, connectivo ad insertionem filamenti 0.3 mm producto, appendice dorsali 0.6 mm longa hebetiacuta. Stylus 4.5 × 0.2–0.3 mm; stigma paulo capitulatum 0.35 mm latum; ovarium 3-loculare glabrum apice in collum breviciliatum 0.5 mm productum; semina 0.5 × 0.3 mm, laevia pyramidata paulo angulata.

Type: flowers white, locally common on boulders in stream courses in talus forest between Camps 2 and 3, elev. 250–650 m, Cerra de la Neblina, Terr. Amazonas, Venezuela, Dec 22, 1953, *Basset Maguire, John J. Wurdack, & George S.*

Bunting 36802 (NY). Paratype: occasional on and around rocks in forest southeast of Camp 3, elev. 900 m, Cerro de la Neblina, Jan 24, 1954, *Maguire, Wurdack, & Bunting 37364.*

The leaf-blades of *M. longidens* are only 12–17 × 7–9 mm and elliptic or scarcely ovate-elliptic with broadly acute apices; the interior calyx lobes are semi-circular.

Macrocentrum maguirei Wurdack, sp. nov.

M. anychioidi Gleason affinis sed foliis longioribus oblanceolatis, petalis antherisque minoribus, staminum appendice dorsali longiore.

Herba exigua ad 15 cm alta superne ramosa caulibus cum internodiis glabris subquadrangulatis nodis setosis setis robustis ca. 1 mm longis. Folia isomorphica; petiolus 1–3 mm longus; lamina 7–15 × 1.5–4 mm, oblanceolata apice anguste rotundata basi attenuata uninervia sparse (praecipue apicem versus) ciliata ciliis ad 1.5 mm longis et 1–3 mm inter se distantibus, supra et subtus primum sparse rubro-glandulosa supra demum glabrata. Flores solitarii 4-meri; pedicellus sub bracteolis ca. 5 mm longus, supra 0.5–0.7 mm; bracteolae 0.9 × 0.2 mm. Hypanthium 1–1.3 × 1.7–2 mm, sparse rubro-glandulosum breviter 8-alatum alis apice unisetosis seto ca. 1 mm longo. Calyx 0.3 mm coalitus, lobis 1.8 × 1 mm late semicircularibus paulo emarginatis. Petala 5.5 × 3 mm, oblongo-obovata apice subtruncata glabra. Stamina isomorphica; filamenta 2.8 mm; antherae thecae oblongae 1.1 × 0.3 mm, poro 0.1 mm diam., connectivo sub loculis (ad filamenti insertionem) inconspicue (0.1 mm) producto, appendice dorsali 0.6 mm longa hebetiacuta. Stylus 2.9 × 0.3–0.5 mm; stigma 0.4 mm latum, vix capitulatum; ovarium 3-loculare, apise truncatum; semina 0.5 × 0.3 mm, late pyramidata minute muriculata.

Type: flowers pink, infrequent in moist shaded places at base of waterfalls at head of Caño Yutaje, elev. 1900 m, Cerro Yutaje, Terr. Amazonas, Venezuela, Feb 17–19, 1953, *Bassett Maguire & Celia K. Maguire 35298* (NY).

M. anychioides has a leaf-blade length-width ratio of 2–2.3 (rather than 3–4.5), much larger petals, larger linear anthers, and dorsal connective appendage only 0.2–0.3 mm long.

Salpinga paleacea Wurdack, sp. nov. Figure 13.

A congeneribus differt petiolis venis foliorum subtus cum pilis paleaceis grandibus armatis.

Subherbacea simplicicaulis, caule subprostrato robusto ad 20 cm longo, ca. 1 cm crasso, ad nodos densissime paleaceo-setoso (setis ca. 10 mm longis, basi 1–1.5 mm latis) alioqui glabro. Petiolus 6–15 × 0.2–0.4 cm, modice paleaceo-setosus et primum gracili-strigosus pilis gracilibus mox caducis; lamina 12–20 × 9–14 cm, late elliptica vel suborbicularis, apice rotundata vel brevissime abrupteque obtuso-apiculata, basi paulo cordata, 7-nervia nervis et nervulis supra paulo insculptis subtus elevatis nervis secundariis 5–10 mm inter se distantibus, margine dense setuloso-ciliata setulis subincurvis 2–3 mm longis, supra primum dense villosula mox glabrata, subtus inter nervulos glabra ad nervos primarios et secundarios modice appresso-setosa (setis longo-attenuatis ad 10 × 0.2 mm) et ad nervos nervulosque gracili-strigulosa pilis laxis paulo caducis. Pedunculus 20–30 cm longus, ad nodum subbasilarem dense paleaceo-setosus alioqui primum gracili-strigulosus demum glabratus. Flores 5-meri, in ramis umbellatis ad pedunculum summum secundi; rami divaricati basi modice paleaceo-setosi pri-

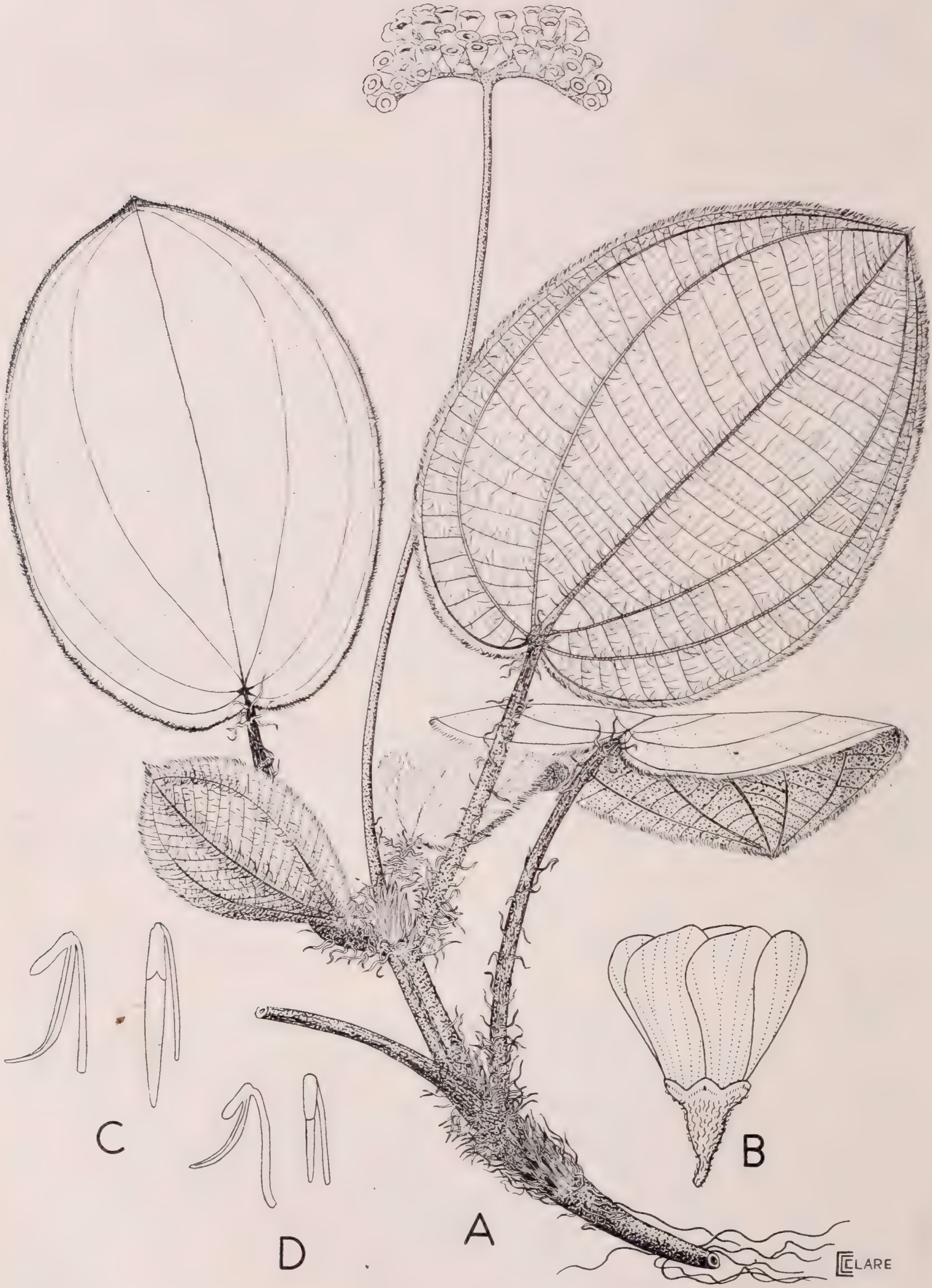


FIG. 13. *Salpinga paleacea.* a, habit, × 0.5; b, flower, × 2; c–d, large and small stamens, × 4.

mum cum pilis gracilibus crispulis modice armati (pilis demum paulo caducis) ad anthesim 1–2 cm longi demum ad 3 cm longi. Pedicelli 1–2 mm longi; hypanthium (ad torum) 3.3 × 2.5 mm, sparse gracili-strigulosum; calyx supra torum 1.3 mm coalitus, lobis 0.5 × 2.9 mm, rotundatis extus cum dente 0.2 mm alto non eminenti armatis. Petala eciliata glabra, 10.8–11.8 × 7–8 mm, asymmetrice obovata apice rotundata. Stamina dimorphica. Staminum maiorum: filamentum 4.4 mm longum; thecae descendentes subulatae 5.2 mm longae, connectivo postice basi brevissime (ad 0.15 mm) calcarato et in appendicem antherae parallelem 2 × 0.4–0.8 mm producto appendice apice breviter (0.4 mm) bilobata lobis rotundatis. Staminum minorum: filamentum 4 mm longum; thecae descendentes subulata 3.2 mm longae, connectivo postice indistincte calcarato et in appendicem antherae parallelem 1.5 × 0.5 mm producto appendice apice rotundata non lobata. Stylus 6.8 × 0.8– (apicem versus) 0.2 mm, glaber; ovarium glabrum, 3-loculare, apice truncatum; hypanthium fructiferum ca. 3 mm longum, 7–10 mm pedicellatum teres (indistincte 10-striolatum), calyce divaricato 6–7 mm lato; semina 1 × 0.4 mm laevia pyramidata.

Type: perennial herb, frequent in deep humus at base of rocks, summit of upper east-facing escarpment of Mt. Ebeni, elev. 700 m, British Guiana, Oct 15, 1951, *Bassett Maguire 32119* (NY).

None of the other known species of *Salpinga* has a paleaceous indument. In fruit shape, *S. paleacea* is intermediate between the southeast Brazilian species (with trigonous fruit) and the remainder of the genus (with long hypanthia). The stamens resemble those of *S. secunda* Schr. & Mart. ex DC. and *S. maguirei* Gleason (and probably *S. ciliata* Pilger) in having a very minute basal spur on the connective rather than the prominent spur pictured by Triana (Trans. Linn. Soc. **28:** *pl. 6, f. 80.* 1871) for *S. margaritacea* (Naud.) Tr. and *S. longifolia* (Cham.) Tr. The habit of *S. paleacea* is rather reminiscent of that of *Tococa platyphylla* Benth.

APOCYNACEAE[22]

Ambelania oleaefolia Monachino, sp. nov. Figure 14.

Frutex glaber; foliis oppositis coriaceis; petiolis ca. 5–7 mm longis; laminis ellipticis, 3–10 cm longis, 0.7–3 cm latis, non nitidis, ad basin obtusis, ad apicem rotundatis vel obtusis vel raro acutis; nervis secundariis utroque ca. 25, supra debilibus, subtus plerumque obscuris; inflorescentiis terminalibus 3–6-floris; sepalis ovatis obtusis 1.5–2.7 mm longis, glabris, squamellis numerosis; corolla magna, extus glabra, tubo ca. 2 cm longo, intus pubescenti, lobis oblongo-oblanceolatis ca. 2–3 cm longis, 1 cm latis; staminibus supra basin tubi corollae 5 mm insertis; antheris sessilibus ca. 4.8 mm longis paene usque ad basin dehiscentibus, lobis basalibus rotundatis non patentibus; ovario glabro; fructibus ellipsoideis usque ad 4 cm longis, 2–2.5 cm latis; seminibus numerosis.

Shrub 0.2–2 m tall, glabrous, the stem subterete; leaves opposite, rigidly coriaceous; petiole about 5–7 mm long; blade elliptic, sometimes narrow, obtuse at the base, rounded to obtuse or rarely acute at the apex, 3–10 cm long, 0.7–3 cm wide, rather dull, slightly paler beneath, the lateral nerves mostly obscure

---

[22] By Joseph Monachino.

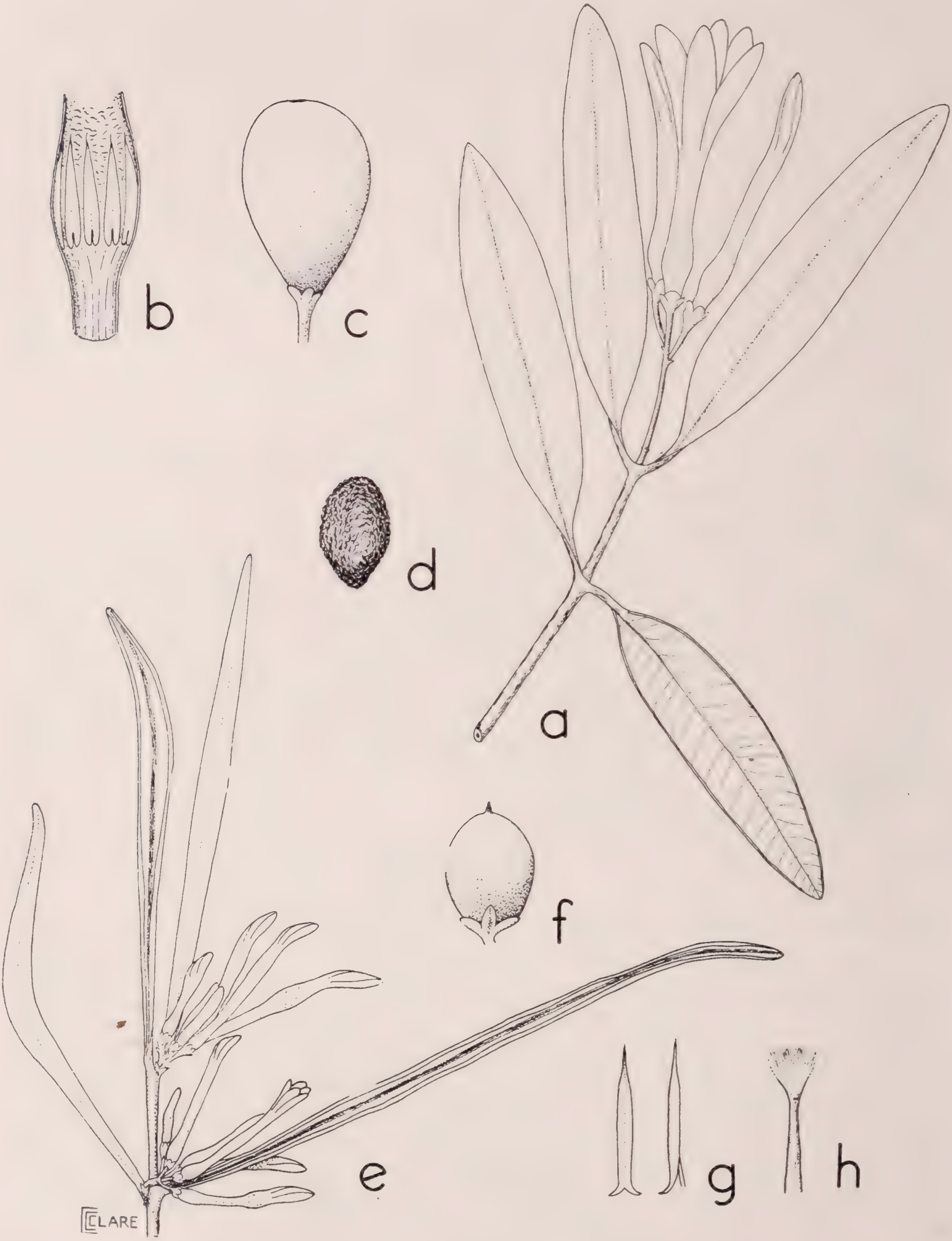


FIG. 14. a–d, *Ambelania oleaefolia*. a (*Maguire & Wurdack 34512*), stem with leaves and flowers, × ¾; b (*Maguire, Cowan & Wurdack 30553*), stamens, × 3; c, (*Maguire, Cowan & Wurdack 30474*), fruit, × ¾; d (same coll.), seed, × 2½. e–h, *Lacmellea pygmaea* (*Maguire & Wurdack 34507*). e, stem with leaves and flowers, × 2; f, fruit, × 2½; g, stamens, × 5; h, style and stigma, × 10.

beneath, faint on the upper side, the principal secondaries about 25 pairs with an average distance of 2–4 mm apart near the middle of the blade; inflorescence a terminal, mostly 3–6-flowered cyme, the common peduncle up to 1.5 cm long, the pedicels up to 8 mm long, with deltoid or ovate small bracts at the base; sepals persistent, broadly ovate, obtuse at the apex, 1.5–2.7 mm long, glabrous, non-ciliate, intracalycine squamellae numerous, ovate or oblong, about 0.4–0.5 mm long; corolla white, fragrant, hypocrateriform, large, glabrous outside, the corolla-tube straight or slightly curved, about 2 cm long, glabrous at the base within but densely pubescent above the insertion of the stamens up to the corolla-lobes, the hairs cylindrical becoming clavate toward the orifice of the tube, the corolla-lobes sinistrorsely convolute, oblong-oblanceolate, about 2–3 cm long, 1 cm wide, glabrous; stamens inserted about 5 mm from the base of the corolla-tube, the anthers sessile, lanceolate, about 4.8 mm long, dehiscent nearly to the base, the terminal sterile membranous acumen about 0.3 mm long, the basal lobes rounded, not spreading; ovary syncarpous, conical above, somewhat rounded at the apex, about 1.7 mm long, glabrous, the style (of a mature flower) 2.3 mm long to the incrassate ring, the crested capitulum about 0.5 mm long, the annular disk closely cohering to the base of the ovary, thin, low, irregular, faintly undulate, less than 0.5 mm high; fruit a berry, ellipsoid, sometimes narrowed toward the base, rounded, up to 4 cm long, 2–2.5 cm in diameter, smooth or verrucose; seeds numerous, irregularly oblong-elliptic, 5–7 mm long, 3–4 mm wide, spongy, minutely roughened with protuberances and microscopically pitted; embryo linear, surrounded by a thin fleshy endosperm; cotyledons oval, about 1 mm long; radicle about 4 mm long.

Type: *Bassett Maguire & John J. Wurdack 34512*, Alto Río Orinoco, Territorio Amazonas, Venezuela, frequent at edge of Savanna No. 3, northwest base of Cerro Yapacana, elev. 150 m, March 17, 1953, shrub 0.2–0.8 m, flowers white, fragrant (holotype NY).

Paratypes: VENEZUELA: Amazonas: *Maguire, Cowan & Wurdack 30474*, Cerro Yapacana, Río Orinoco, occasional, savanna at base of Cerro Yapacana, 175 m alt., Dec 31, 1950, sprawling shrub to 5 dm, flowers white, fragrant; unicate. *Maguire, Cowan & Wurdack 30553*, Cerro Yapacana, Río Orinoco, occasional, Savanna No. 3, Jan 1, 1951, shrub to 2 m, flowers white; unicate. *Maguire & Wurdack 34504*, Alto Río Orinoco, occasional in Savanna No. 2, northwest base of Cerro Yapacana, elev. 150 m, March 17, 1953, shrub 0.2–0.8 m, flowers white, fragrant.

This species is readily separated from the dozen previously known species of *Ambelania*. The long corolla-tube, pilose within, would suggest comparison with *A. macrophylla* Muell.-Arg. and *A. grandiflora* Huber in the revision of the genus by Monachino (Lloydia **8:** 109–130. 1945). The leaves in our newly discovered plant are much smaller. The leaf size is closer to that of *A. laxa* (Benth.) Muell.-Arg., but here the resemblance even in foliage stops at size alone. It is interesting to note that *A. oleaefolia* grows in savanna country, an habitat quite different from that of *A. laxa*. It does not have the stem swollen at the base like the riparian *A. laxa*.

Aspidosperma album (Vahl) R. Ben. ex M. Pichon?

Maguire & Wurdack 35663, Río Guainía, Amazonas, along Caño Pimichín below Pimichín, elev. 125–135 m, April 14, 1953, slender tree 10 m, fruit brown.

Only a fruiting specimen is available. The matured follicle is oblong-obovate and much smaller than has been described for either this species or *A. spruceanum* Benth. ex Muell-Arg., about half the size, 4 cm long, 2 cm wide. The stipe is a little over 1 cm long. The seeds are numerous, oblong to triangular, narrowly papery-winged, 2–2.5 cm long, 1.3–1.7 cm wide; cotyledons orbicular, about 1.3 cm wide, the sinus closed, the radicle 3 mm long, not surpassing the lobes of the cotyledons. The plant is named *A. album* rather than *A. spruceanum* because the petiole is longer than that of the latter, 1.5–2.5 cm long, and the venation on the underside is slightly more expressed. Woodson (Ann. Missouri Bot. Gard. **38:** 196. 1951) hypothesizes possible hybridization to account for variability in *A. album.*

Aspidosperma decussatum Woods.

The fruit is now known (*T. Lasser 1805*, Kavanayén, Bolívar, Mr 1946). Follicle stipitate, asymmetrically oval, narrowed at the base, about 7 cm long, 4.5 cm wide, velvety-pubescent, the ridge about 2 cm from the nearest margin, the stipe 1.5 cm long; seeds many, orbicular, papery-winged, about 4 cm wide; cotyledons orbicular, about 1.5 cm wide, the sinus closed; radicle 3 mm long, not surpassing the lobes of the cotyledons. This opposite-leaved species has been collected only in the area of the type locality, Ptari-tepuí, Kavanayén, and Chimantá.

Aspidosperma exalatum Monachino, sp. nov. Figure 15.

Arbor; ramulis primo puberulis, denique glabris; foliis alternis coriaceis glabris; petiolis 1–1.5 cm longis; laminis oblongis, (6–) 10–13 cm longis, (3–) 4–6.5 cm latis, ad basin obtusis vel rotundatis, ad apicem rotundatis emarginatisque, subtus pallidis; nervis secundariis utrinque prominentibus, reticulo venulorum prominulo; fructibus sessilibus crasse lignosis inaequaliter ovatis, 5–10 cm longis, 3.5–4.5 cm latis, tomentulosis minute rugulosis, ad apicem apiculatis; seminibus suboblongis vel ovatis, 4–5.5 cm longis, 2.5–3 cm latis, non membranaceo-alatis, marginibus crassiusculis angustisque; cotyledonis suboblongis, ca. 4 cm longis, 2 cm latis; radicula ca. 5 mm longa, lobos cotyledonorum non excedenta.

Tree 5–7 m tall, the branchlets moderately stout, puberulent when young, becoming glabrous; leaves alternate or approximate, rigidly coriaceous, completely glabrous (old leaves); petiole dark, 1–1.5 cm long; blade oblong, obtuse or rounded at the base, rounded and emarginate at the apex, thick-rimmed at the margins, (6–) 10–13 cm long, (3–) 4–6.5 cm wide, paler beneath than above but not markedly glaucous, the secondary nerves raised on both surfaces, the principal ones averaging 5–7 mm apart near the middle of the blade, the reticulation of veinlets prominulous; flowers lacking; sepals (in fruit) ovate-lanceolate, white-tomentulose outside, about 2 mm long; follicle thickly woody, asymmetrically oval, sessile, apiculate at the apex, 5–10 cm long, 3.5–4.5 cm wide, closely brownish or rusty-tomentulose, minutely roughened, the ridge about 2 cm from the nearest margin; seeds few in each follicle, smoke-colored, centrally tinted with bluish-green, oblongish varying to ovate, not papery-winged, the margins relatively thick and narrow, less than 1 cm beyond the embryo; cotyledons oblongish, cordate or emarginate at the base with a close sinus, about 4 cm long, 2 cm wide; radicle about 5 mm long, not surpassing the lobes of the cotyledons.

Type: *Bassett Maguire & John J. Wurdack 34611*, Alto Río Orinoco, Territorio Amazonas, Venezuela, along Yapacana caño between laguna and Río Orinoco, elev. 150 m, March 20, 1953, tree (holotype NY). Paratype: VENEZUE-

LA: Amazonas: *Maguire & Wurdack 34909,* Río Casiquiare and tributaries, occasional along Río Pacimoni between Caños Arapacua and Boridahari, elev. 110 m, April 7, 1953, spare tree 5–7 m, fruit brown.

The leaves of *A. exalatum* were not matched with any species heretofore described. The venation somewhat recalls that of *A. verruculosum* Muell.-Arg., but the secondaries are much further apart. The reduced thickened wing of the seed is a feature which was not noted for any species of *Aspidosperma* by Woodson in his monograph of the genus. However, A. Ducke (Anais Acad. Bras. Ci. **27:** 382. 1955) mentions such a wing for *A. nitidum* Benth. ex Muell.-Arg. Fruiting material is not available for many species and consequently it remains to be seen how rare exalate seeds are in the genus.

Aspidosperma glaucum Monachino, sp. nov. Figure 15.

Arbor; ramulis glabrescentibus; foliis alternis coriaceis subglabris; petiolis ca. 2 cm longis; laminis oblongo-obovatis vel obovatis, 10–12 cm longis, (3–) 4–6 cm latis, ad basin cuneatis, ad apicem obtusis, supra nitidis, subtus glaucis; nervis secundariis debilibus; venis obscuris; fructibus crasse lignosis ovali-pyriformibus, ca. 12 cm longis, 8.5 cm latis, glabris minute rugulosis; seminibus orbicularibus, 7–8 cm latis, membranaceo-alatis; cotyledonis late ovatis, ca. 3 cm longis, 2.5 cm latis; radicula ca. 5 mm longa, lobos cotyledonorum excedenti.

Tree 20 m tall, essentially glabrous, the branchlets moderately thick, brownish, glabrescent, the buds grey-tawny-puberulent; leaves alternate or approximate; petiole 0.8–2.3 cm long, brownish, sometimes sparsely appressed-puberulent particularly toward the base; blade coriaceous, oblong-obovate or obovate, cuneate at the base, very short-acuminate or rather apiculate at the apex, revolute at the margins, 10–12 cm long, (3–) 4–6 cm wide, essentially glabrous, a few scattered hairs (up to about 0.17 mm long) sometimes present particularly along the midrib, shining above, strikingly glaucous-colored beneath (covered with scurfy material that can be scraped off), the secondary nerves faint, not raised, the principal ones averaging 5–10 mm apart near the middle of the blade, the veins obscure; flowers lacking; follicle (unattached) thickly woody, oval-pyriform, about 12 cm long, 8.5 cm wide, glabrous, the surface minutely roughened, the ridge 3.5 cm from the nearest margin; seeds papery-winged, more or less orbicular, 7–8 cm wide; cotyledons broadly ovate, shallowly cordate at the base, about 3 cm long, 2.5 cm wide; radicle 5 mm long, surpassing the lobes of the cotyledons.

Type: *Bassett Maguire & Louis Politi 28255,* Cerro Sipapo, Territorio Amazonas, Venezuela, cumbre, Savanna Camp to Caño Profundo and East Terrace via Caño Negro, elev. 1600 m, Jan 8, 1949, tree 20 m high, 20 cm diam., leaves glaucous beneath, seed broadly membranous winged (holotype NY).

In its coriaceous, glabrous, glaucous-colored leaves, *A. glaucum* recalls *A. excelsum* Benth. (altogether different in its spinose-verrucose follicles), the pallor on the under side of the leaves of the former being more marked. The leaves of our new species seem to differ further in being apiculate at the apex, in having revolute margins and secondary nerves appreciably fainter. The buds are tawny-tomentulose, not grey as in *A. excelsum.*

As indicated above, *A. glaucum* is easily and with certainty separated from *A. excelsum* by fruit character. When, however, it is compared with *A. schultesii* Woodson, similar in its heavily coriaceous leaves with whitened under side and

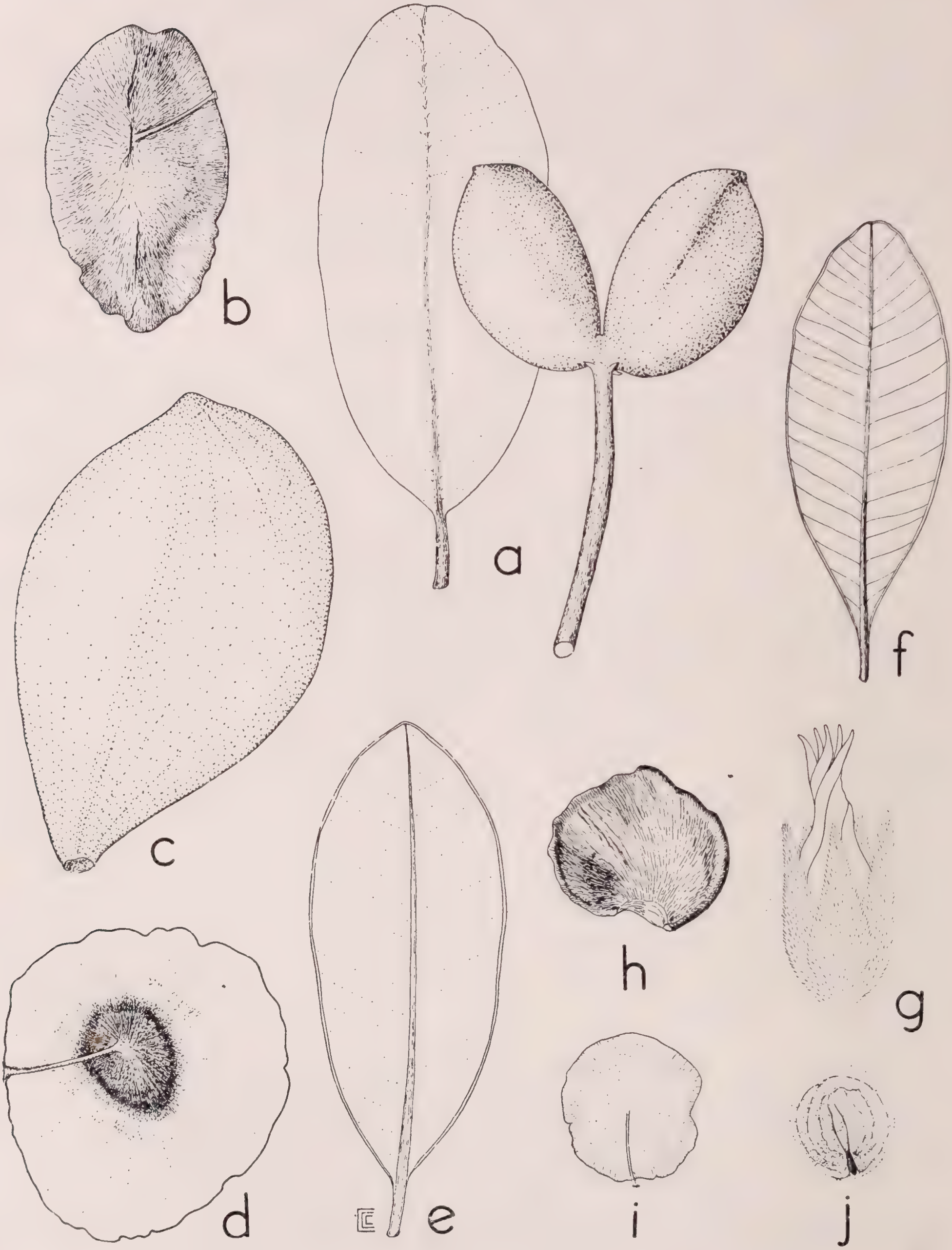


FIG. 15. a, b, *Aspidosperma exalatum* (*Maguire & Wurdack 34611*): a, leaf and fruit, × ½; b, seed, × 1. c–e, *Aspidosperma glaucum* (*Maguire & Politi 28255*). c, fruit, × ½; d, seed, × ½; e, leaf, × ½. f, g, *Aspidosperma neblinae* (*Maguire, Wurdack & Bunting 37084*). f, leaf, × ½; g, flower, × 5. h–j, *Paralyxia macrophylla* (*Guppy 7494*). h, fruit, × ½; i, seed, × ½; j, embryo, × 1.

immersed venation, there is difficulty. The two species are known only from the types. The material is essentially incomparable, as one is in fruit, the other in flower. The stems of the branchlets are blackish in *A. schultesii*, the petioles much longer, 4–4.5 cm long, black, the blades relatively longer and narrower, not as hoar-frost-white beneath but rather the color of those of *A. excelsum*. The under side of the leaves is covered for the greater part with very short grey appressed hairs, while those of *A. glaucum* are either glabrous or have scattered longer hairs along or near the midrib. The young leaves and calyx of *A. schultesii* have a sulphur-colored indumentum; and whereas the buds of *A. glaucum* are also colored, they are of a different hue, a shade of pale tawny, and the indumentum consists of longer hairs. From consideration of the different habitats of the two plants, it would seem unlikely that they represent variations of the same species. *A. schultesii* was collected on a low ridge separating two watersheds, headwaters of Ira-Igarape and Igarape Abiu, affluent of Río Taraíra, Amazonas, Brazil, in a typical balata-type forest, in a region of endemism (communication from Dr. Schultes).

A leaf of the type was sent to Heber W. Youngken for microscopic examination. Dr. Youngken wrote: "I have made a microscopic examination of portions of the leaf and find that the scurfy material which can be scraped off from the lower surface consists largely of outgrowths of the epidermal cells as conical to branched, unicellular hairs, the branched type occurring in several forms, the main stalk frequently bifurcate at its distal end into straight or curved sharp-pointed branches, another form resembling somewhat the antlers of the deer or antelope. Many of the hairs possess an indistinct lumen; in others it is extremely narrow, and the walls are greatly cuticularized. Some cuticular scales also occur."

Aspidosperma neblinae Monachino, sp. nov. Figure 15.

Arbor; foliis alternis primo subtus tomentulosis dein puberulis; petiolis ca. 1 cm longis; laminis obovatis, 7–11 cm longis, 3.5–5 cm latis, ad basin cuneatis, ad apicem rotundatis, venis prominulis; floribus congestis; pedicellis quam calyce brevioribus; sepalis 3–4 mm longis, extus tomentulosis; corolla glabra, tubo angulato, 4.3 mm longo, lobis lineari-lanceolatis acutis, 3.7 mm longis; staminibus media tubi corollae insertis; antheris 0.95 mm longis; ovario glabro; fructibus ovali-pyriformibus velutinis, 7–9 cm longis, 3.5–6 cm latis, stipite 1.5–2 cm longo; seminibus plusminusve orbicularibus membranaceo-alatis, usque ad 6 cm latis; cotyledonis orbicularibus, ca. 2 cm diam.

Tree 5–15 m tall, the stems of the branchlets moderately stout, closely tomentulose when young; leaves alternate (rarely subopposite), coriaceous, closely grey-(faintly tawny-) tomentulose beneath when young, becoming merely puberulent; petiole short, about 1 (-1.5) cm long, dark-colored; blade oblong-obovate or obovate-cuneate at the base, rounded to subemarginate at the apex, (6-) 7–11 cm long, 3.5–5 cm wide, the venation somewhat prominulose, the midrib little raised on the upper surface; inflorescence corymbiform; flowers white, crowded, the pedicel shorter than the calyx; sepals acutish, 3–4 mm long, closely grey-tomentulose outside, hairy within on the upper part; corolla glabrous, the tube angulate, slightly exserted from the calyx, 4.3 mm long, the lobes spiral-contorted in aestivation, sharply acute, linear-lanceolate, about as long as the corolla-tube, 3.7 mm long; stamens inserted at about the middle of the corolla-tube, the anthers 0.95 mm long; ovary glabrous; fruit stipitate, woody, oval-pyriform, flattened, grey-tawny-velvety-tomentulose, the stipe 1.5–2 cm long, the body 7–9 cm long, 3.5–6 cm broad, the ridge 1.5–2 cm from the nearest margin; seeds papery-winged, more or less orbicular, varying in size, 2.5–6 cm in diameter; cotyledons orbicular, about 2 cm broad, cordate at the base with closed sinus; radicle 4 mm long, not surpassing the cotyledon-lobes.

Type: *Bassett Maguire, John J. Wurdack & George S. Bunting 37084*, Cerro de la Neblina, Río Yatua, Teritorio Amazonas, Venezuela, in scrub forest along escarpment west of Cumbre Camp, elev. 1700–1800 m, Jan 6, 1954, bushy tree 5 m, flowers white (holotype NY).

Paratypes: VENEZUELA: Terr. Amazonas: *Maguire, Wurdack & Bunting 37245*, Cerro de la Neblina, Río Yatua, occasional along west escarpment edge 2 km north of Cumbre Camp, elev. 1800 m, Jan 12, 1954, tree 8 m, fruiting; unicate. *Maguire, Wurdack, & Bunting 37284*, Cerro de la Neblina, Río Yatua, frequent in upper slope forest above Camp 4, elev. 1500–1700 m, Jan 13, 1954, tree 6–15 m, fruit green.

A. neblinae belongs in the series *Nobiles* Woodson and suggests alliance with *A. steyermarkii* Woodson, and less so with *A. decussatum* Woodson.

Aspidosperma sp. aff. *A. neblinae* Monachino.

Cowan & Wurdack 31166, Serranía Parú, Río Parú, Caño Asísa,, Río Ventuari, Amazonas, Venezuela, occasional, cumbre just south of head of valley of Camp Caño, sabanita and scrub forest, 2000 m alt., Feb 2, 1951, tree 4–10 m tall, fruit green, abundant white latex.

Material with flowers past anthesis and matured fruits is available. As far as can be seen in the absence of flowers, the plant differs from *A. neblinae* chiefly in the persistent grey tomentum which forms a close hoary covering on the under side of the leaves. The fruits are not thickly velutinous as in *A. neblinae*, but only minutely tomentulose; their lightly roughened surface is exposed. The seeds are more or less similar to those of *A. neblinae*, generally oval-orbicular but varying to triangular, about 5 cm long, 3.5–4 cm wide; cotyledons orbicular, about 1.7 cm in diameter, cordate at the base with closed sinus; radicle 3 mm long, not surpassing the cotyledon-lobes. The calyx (past anthesis) is about 3 mm broad at the base, the lobes about 3.3 mm long. The leaf-blades are (6–) 7–16 cm long and 3.5–7 cm wide. The vegetative indumentum is similar to that of *A. spruceanum* Benth. and *A. fendleri* Woods., but the hairs average twice as long. The leaves are more strongly obovate, the broadest part being further toward the summit; the apex is emarginate or rounded, only rarely with the slightest indication of an acumen.

Condylocarpon hirtellum Ducke.

Maguire, Wurdack & Bunting 36752, Ríos Pacimoni-Yatua, Casiquiare, Territoria Amazonas, Venezuela, along flooded margin of uppermost Río Yatua, 100–140 m elev., Dec 12, 1953, woody vine, flowers creamy yellow, fruit brown. *Krukoff 6760*, basin of Rio Madeira, State of Amazonas, Brazil, municip. Humayta, near Livramento, on Rio Livramento, terra firma, Oct 20, 1934, leaves and fruits. *Krukoff 8265*, basin of Rio Solimoes, state of Amazonas, Brazil, municip. São Paulo de Olivença, near Palmares, Sept 11–Oct 26, 1936, old clearing, flowers in bud.

Our first Venezuelan representative of the genus *Condylocarpon* connects *C. hirtellum* with *C. pubiflorum* Muell.-Arg. Isotypes of both are at The New York Botanical Garden (Esperança and "prope Barra," respectively). The two seem to differ principally in the character of the indumentum. *C. hirtellum* is more densely pubescent, the hairs on the stem spreading instead of appressed, the leaves subrounded at base instead of obtusely cuneate, the petiole slightly shorter, about 5 mm long instead of 8 mm. The Río Yatua specimen has the hairs on the stem dense and spreading as in *C. hirtellum,* but the leaves obtuse at the base and with longer petioles as in *C. pubiflorum;* the peduncles are shorter as in *C. pubiflorum.* Perhaps the two are not specifically distinct.

Couma rigida Muell.-Arg.

VENEZUELA: *Maguire & Politi 28098,* Cerro Sipapo (Paráque), Territorio Amazonas, forest along lower Caño Negro, summit of Cerro Sipapo, 1400 m alt., Jan 1, 1949, small tree. *Tate 732,* summit of Mount Duida, dry slope of Savanna Hills, alt. 4400 ft, Aug 1928–April 1929, small tree, flowers red, juice milky. *J. A. Steyermark 58243,* summit of Serro Duida, Savanna Hills, alt. 1025–1200 m, Sept 2, 1944 (MO.). BRITISH GUIANA: *Maguire & Fanshawe 23232,* Kaieteur Plateau, rare to occasional, bush island on savanna, May 5, 1944, tree 10–12 m high, 25 cm diam., copious white latex, fruit subglobose, green, not quite ripe, seeds flat, oval, testa brown.

The species were originally described from Bahia, Brazil. Its appearance in the Guayana Highlands is most surprising. There is no record of its collection in the vast intervening area. The collections from Mt. Duida (*Tate 732, Steyermark 58243*) are erroneously cited as *C. utilis* in Bull. Torrey Club **58:** 298, 453 (1931) and Fieldiana Bot. **28:** 1043 (1957). The Ttate collection was discussed by Monachino in Lloydia **6:** 239 (1943). *Steyermark 58256,* cited together with *58243* under *C. utilis* in Fieldiana, is probably the same, but the specimen was not seen by me. *Steyermark 58243* contains flowers; the flowers are crowded in the inflorescence and the stigma-lobes are about 1 mm long, as previously described for the topotypical material. The calyx is puberulent. If the plants from Bahia and Guayana are not precisely identical, they certainly are very closely allied.

Forsteronia gracilis (Benth.) Muell.-Arg., var. nov.?

VENEZUELA: Amazonas: *B. Maguire & C. K. Maguire 35515,* Serranía Yutaje, Río Manapiare, occasional at streamside near Base Camp, elev. 175 m, March 3, 1953, climbing woody vine, flowers white, fragrant. BRAZIL: Estado do Amazonas: *J. Murca Pires 60,* Maués, praia alagavel do rio, Nov 30, 1946, cipó, flôres brancas, folhas triverticiladas.

These specimens differ from typical *F. gracilis* in the anthers which are glabrous or rarely with a few dorsal hairs, instead of barbellate, and in the corolla-lobes which are much more densely pilose and with longer hairs within. The leaves may be opposite or ternate. It has not been possible to see a specimen of *F. pilosa* (Vell.) Muell.-Arg., known from Bahia, Rio de Janeiro, and Minas Gerais; this species is related to *F. gracilis* and distinguished as having "corolla-lobes conspicuosly pilosulose within, anther tips glabrous or essentially so." *F. gracilis* previously has been reported from British Guiana (many citations) and only in the vicinity of Manáos in Brazil. *Ducke 1890* from Esperanca, Amazonas, Brazil, has typically barbellate anthers. *Krukoff 8534* from Municip. São Paulo de Olivença, near Palmares, Brazil, and *Buchtien 1896* from Mapiri, Bolivia, are probably also *F. gracilis,* but the flowers are too young for proper study.

Forsteronia guyanensis Muell.-Arg.

VENEZUELA: *Wurdack & Monachino 39733,* Serranía Imataca, Territorio Delta Amacuro, occasional in forest 1–3 km north of Río Guanamo, El Palmar-Raudal Trail, upper Río Toro drainage, elev. 270–470 m, Nov 23, 1955, vine climbing 20 m in trees, flowers white.

This collection has a corymbose inflorescence, as described for *F. brevifolia* Mgf. by Woodson in the key to the species of *Forsteronia* (Ann. Missouri Bot. Gard. **22:** 155. 1935). It seems, however, that *F. brevifolia* should be regarded as merely a synonym of *F. guyanensis.* The type was collected along the Tocantins, Amazonas, Brazil. *Ricardo de Lemos Fróes 21471* (Mata do Igarapé do Massabo, Cabary, Rio Negro, Amazonas, Brazil) agrees very well with the photo of the type of *F. brevifolia*, but also ties up with *Wurdack & Monachino 39733* and some of the Guiana material of *F. guyanensis.* The NYBG specimens of *F1418* and *F2113* from British Guiana, cited as *F. gracilis* (Benth.) Muell.-Arg. in Bull. Torrey Club **75:** 554 (1948), are of *F. guyanensis. Killip & Smith 30151* (Manáos, Amazonas, Brazil), cited by Woodson as *F. riedelii* Muell.-Arg., and *Ducke 1980* and *420* (Manáos), which are similar to the Killip & Smith clolection, are probably also conspecific with *F. guyanensis.* The leaves of these specimens are not altogether eglandular; there are small glands or gland-scars at the base of some leaf-blades. It is suspected that glandulosity is a somewhat variable character in *F. guyanensis*, as are the size and shape of the sepals, the size of the corolla, and the kind of indumentum. In reference to *F. riedelii*, Woodson states (p. 177) that the type specimen was collected by Riedel and cited as from Serra d' Estrella. "It will not be surprising, therefore, if the specimens cited from Amazonas may eventually be proved to represent a distinct species."

Galactophora pulchella Woodson.

VENEZUELA: Amazonas: *Maguire & Wurdack 34481*, Alto Río Orinoco, infrequent in scrub near Yapacana caño laguna, northwest base of Cerro Yapacana, elev. 150 m, March 16, 1953, shrub 0.5–1.5 m, flowers pink. *Maguire, Wurdack & Bunting 37595*, Río Pacimoni, rare in savanna on right bank of Río Pacimoni 50 km above mouth, 100–140 m elev., Feb 7, 1954, shrub 1.5 m, flowers pink. *Maguire, Wurdack & Bunting 37609*, Río Siapa, Casiquiare, along Caño Hechimoni (8 km above mouth of Río Siapa), 100–130 m elev., Feb 9, 1954, shrub 2 m, flowers pale pink, the tube outside basally deep rose.

The species was determined from description and photo of the holotype specimen, *Spruce 3718*, Caño Pimichín, Amazonas, Venezuela (the citation in the original description is an error). The three collections cited above are all from the phytogeographical province of the type locality. The corollas are manifestly setose. The proper (infrastaminal) part of the corolla-tube is up to 1.5 cm long. Some of the leaves are narrow, only 1.5 cm wide; while many of the leaves are "abruptly rounded and obscurely cordate," as described, several are somewhat narrowed and acutish at the base.

Galactophora pumila Monachino, sp. nov. Figure 16.

Frutex, 0.1–0.3 m altus; caulibus primo puberulis; foliis oppositis subsessilibus coriaceis elliptico-oblongis subglabris, 2–4 cm longis, 0.7–1.4 cm latis, ad basin obtusis, ad apicem rotundatis vel obtusis; nervis secundariis venisque obscuris; inflorescentiis 1- vel 2-floris; sepalis lanceolatis, 8–10 mm longis, 1.5–2 mm latis, plerumque glabris; corolla infundibulariformi, tubo ca. 12 mm longo, gula 15 mm longa extus glanduloso-setosa, intus infra staminum pubescenti, lobis corollae 15 mm longis; staminibus ad apicem tubi insertis; antheris 4–5 mm longis; ovario glabro, disco annulato subundulato; fructibus gracilibus, 9–15 cm longis, glabris.

Dwarf erect shrub 0.1–0.3 m tall, the stems slender, young parts puberulent with minute spreading hairs; leaves opposite, almost sessile (the petiole about 1 mm long), rigidly coriaceous, elliptic-oblong, narrowed toward the obtuse base, rounded or obtuse and sometimes apiculate at the apex, thick and sometimes subrevolute at the margins, 2–4 cm long, 0.7–1.4 cm wide, glabrous except for the sparsely puberulent petiole and leaf apex, often punctate beneath, the midrib sunken on upper side, slightly raised beneath, the secondary nerves and veins obscure; inflorescence 2- or 1-flowered; calyx without squamellae (?), the lobes lanceolate, 8–10 mm long, 1.5–2 mm wide, essentially glabrous, sometimes sparsely glandular-setose or faintly puberulent; corolla infundibuliform, the tube proper 12 mm long, glabrous outside, densely hairy beneath the stamens within, the throat about 15 mm long, glandular-setose along the nerves outside, the lobes with right margins overlapping, ovate, about 15 mm long, the midrib extending as a nerve down corolla-throat; stamens at the top of the tube proper, the anthers 4–5 mm long; ovary glabrous, the disk annular, faintly undulate; mericarps erect, united below for about 1.5–2 cm, very slender, 9–15 cm long, less than 2 mm thick, glabrous; seeds subscaphiform, about 4 mm long, 0.7 mm broad, brown, glabrous, the coma sessile, about 2 cm long, white.

Type: *Bassett Maguire & John J. Wurdack 35563*, Río Guainía, Territorio Amazonas, Venezuela, occasional in Sabana El Venado on left bank of Caño Pimichín above Pimichín, elev. 140 m, Apr 14, 1953, shrub 0.1–0.3 m, flowers pink (holotype NY).

Paratypes: COLOMBIA: *Maguire, Wurdack & Bunting 36274*, Río Atabapo, rare in savanna 1 km west of Cacagual, 130 m elev., Nov 19, 1953, shrub 0.2–0.3 m, flowers pink; unicate. VENEZUELA: Amazonas: *Maguire, Wurdack & Bunting 36358*, Río Guainía, occasional in Sabana El Venado on left bank of Caño Pimichín above Pimichín, 120–140 m elev., Nov 23, 1953, shrub 0.2–0.3 m, fruit maroon; unicate.

G. pumila is readily distinguished from the six other known species in the genus by its small, coriaceous, obscurely nerved leaves. Its leaves somewhat resemble those of *Salpinctes kalmiaefolius* Woodson rather than any species of *Galactophora*; they are a little differently shaped, however, narrowed and obtuse at the base rather than rounded or subcordate, and more generally rounded at the apex.

Galactophora schomburgkiana var. **megaphylla** Monachino, var. nov.

Haec varietas a var. *schomburgkiana* praecipue recedit foliis multo majoribus, 7–15 cm longis, 6–11 cm latis, et lobis calycis longioribus 12–15 mm longis.

Vine to 5 m, the stem stout, puberulent and glandular-setose; leaves opposite, subsessile; petiole 3–4 mm long; blades thinly coriaceous, broadly ovate, cordate at the base, rounded and apiculate at the apex, subrevolute at the margins, (7–) 10–15 cm long, (6–) 8–11 cm wide, slightly roughened on both surfaces, nitidous above and puberulent on the margins and along the nerves, sometimes setose on the midrib, paler beneath, puberulent, punctate-pustulate with the hardened bases of the hairs, the secondary nerves about 15 pairs, slightly elevated, the veinlets obscure; inflorescence 3–5-flowered; pedicel up to 13 mm long; calyx setose and puberulent, the lobes lanceolate, acuminate, 12–15 mm long, about 4 mm broad; corolla infundibuliform, densely pubescent below the stamens within, the tube proper about 2.5 cm long, the throat approximately as long, glandular-setose on the nerves without, the corolla-lobes about 2 cm long; anthers about 8 mm long; ovary glabrous, the disk annular, lightly undulate; mericarps erect, united at the base 1–1.5 cm, 9–18 cm long, about 3–6 mm thick, densely setose; seeds subscaphiform, 6–7 mm long, 1.5–2 mm broad, brown, glabrous, the coma sessile, about 2 cm long, pale tawny; embryo linear; cotyledons 2.8 mm long, 0.8 mm wide; radicle about 2 mm long.

Type: *Bassett Maguire, R. S. Cowan, John J. Wurdack 29706*, Cerro Duida, Río Cunucunuma, Amazonas, Venezuela, ridge west of Caño Culebra, 1800 m alt., Nov 22, 1950, slender vine to 5 m long, flowers pink, fruit red (holotype NY).

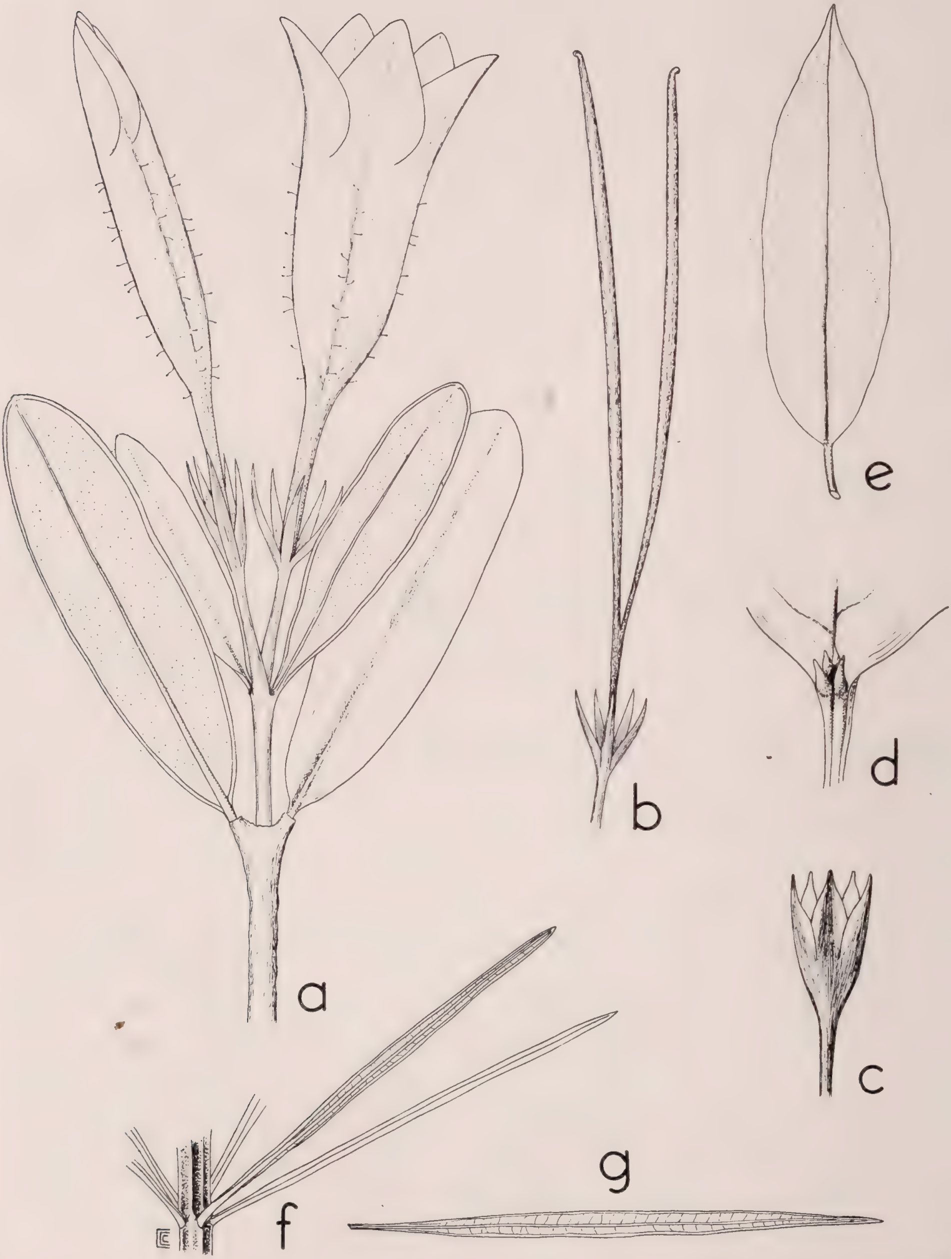


FIG. 16. a, b, *Galactophora pumila* (*Maguire & Wurdack 35563*). a, stem with leaves and flowers, × 1½; b, fruit, × 1. c–e, *Mesechites acutisepala* (*Maguire, Cowan & Wurdack 29488*). c, calyx, × 2½; d, leaf glands, × 5; e, leaf, × ½. f, g, *Mandevilla filifolia*. *f* (*Wurdack & Monachino 40975*), stems with leaves, × 1½; g (*Maguire & Maguire 35167*), leaf, × 1.

The leaves of *G. schomburgkiana* var. *megaphylla* are the largest in the genus as known up to date. The leaves in the type collection appear somewhat paler beneath than those of *G. schomburgkiana* Woodson var. *schomburgkiana;* the secondary nerves are not so strongly expressed, the connecting veins are fainter or obscure. Although the calyx is much larger, the corolla is approximately the size of that of the typical variety.

The typical variety previously was known to us only from the original description of the holotype and a single specimen, *G. H. H. Tate 1134*, Auyán-Tepuí, alt. 1850 m, Venezuela, 1937-1938 (NY). This Ttate plant was erroneously reported as "*G. crassifolia*" in Brittonia **3:** 190 (1938), and the reference to Auyán-tepuí under this species in Fieldiana Bot. **28:** 1073 (1957) seems to be a perpetuation of the misidentification. Now eight additional excellent collections of typical *G. schomburgkiana* have been made by the 1951-1952 Maguire, Wurdack and Cowan expeditions to Amazonas and Bolívar in Venezuela (all on Roraima sediments, high sandstone). Because of this rich comparative material that has recently become available ,it is now possible to at least partially evaluate the proposed variety; for fuller understanding, further collections of *G. schomburgkiana* var. *megaphylla* are necessary.

Himatanthus Willd.

A. Ducke, with good reason, challenges the segregation of this genus from *Plumeria* L. (Anais Acad. Bras. Ci. **27:** 384. 1955). Recent material presents two very anomalous collections of *Himatanthus attenuata* which will be discussed below.

Himatanthus attenuata (Benth.) Woods.

VENEZUELA: Amazonas: *Maguire, Cowan & Wurdack 30764-A*, Cerro Yapacana, Río Orinoco, caño north of Cerro Yapacana to Río Orinoco, Jan 6, 1951, tree 10 m tall, flowers white. *Maguire, Cowan & Wurdack 30499*, Cerro Yapacana, Río Orinoco, occasional, savanna No. 1, Dec 31, 1950, shrub to 2 m, flowers whitish. *Maguire & Wurdack 34495*, Alto Río Orinoco, frequent in scrub near Yapacana caño laguna, northwest base of Cerro Yapacana, elev. 150 m, March 16, 1953, shrub 1.5–4 m, flowers white, fragrant. *Maguire, Wurdack & Bunting 36178*, Great Rapids of the Orinoco, frequent in open moist area along contact between crystalline laja and Orinoco gallery forest 1 km east of Hotel Amazonas, Pto. Ayacucho, 100–120 m elev., Nov 12, 1953, shrubby tree 3–6 m, flowers white, fragrant. COLOMBIA: *Maguire, Wurdack & Bunting 36281*, Río Atabapo, occasional in savanna 1 km west of Cacagual, 130 m elev., Nov 19, 1953, shrub 1–2 m, flowers white, "Platanote."

The first collection cited, *30764A*, is strikingly different from the typical plant. The bracts of the inflorescence are very large, about 3.6 cm long and 2.3 cm broad. The corollas are large, about 6.5 cm long (boiled); corolla-tube 2.5 cm long, the lobes 4 cm long, 1.5 cm wide, the anthers about 1.8 mm long. The leaves are atypically rounded at the apex and they have strong marginal nerves; petioles 2–4 cm long; blades shining, oblanceolate, gradually and greatly narrowed at the base, 12–17 cm long, 5–7 cm wide, the secondary nerves close and rectlinear, netted venation prominent on both sides. The large bracts and the strong marginal nerves of the leaves are like those of *H. bracteata* (A. DC.) Woods., the prominent venation, texture, and luster of the leaves are of good *H. attenuata*.

The Colombian collection, *36281*, is not only very different from the typical plant but also provides a striking contrast with *30764-A*. The leaves are sessile or subsessile, very rigid, short (3–9.5 cm long), rounded at the apex; inflorescence crowded, small, the bracts oblong, 1–1.5 cm long, mostly rounded at the apex; flowers moderate in size (the buds up to 4.5 cm long). The netted venation of the leaves is gross and not sharply raised, the marginal nerve is prominent, and the gloss of the leaf surface is not so strong as usual.

The leaves of the three remaining collections cited above are rounded at the apex, otherwise they are typical. Hybridization has been suggested for the genus, but at present one can only speculate on the reason for the great divergence shown in *30764-A* and *36281*.

Lacmellea pygmaea Monachino, sp. nov. Figure 14.

Frutex gracilis, 0.1–0.3 m altus; caulibus primo puberulis; foliis oppositis subsessilibus linearibus, 3–5.5 cm longis, ca. 2–3 mm latis, margine revolutis, costa subtus glabra vel puberula, venis secundariis obscuris; inflorescentiis axillaribus sessilibus; sepalis ovatis glabris vel obscure ciliatis, 1.3–1.7 mm longis; tubo corollae ca. 11 mm longo, extus glabro vel hirtello, intus infra pubescenti; lobis corollae oblongis obtusis, ca. 4 mm longis, 1.7 mm latis; staminibus in parte superiori tubo corollae insertis; antheris 0.6–0.7 mm longis glabris, ad basin sagittatis, lobis dein uncinatis; ovario glabro ad apicem attenuato; stylo ca. 1.3 mm longo; stigmatis capitulo 0.4–0.5 mm longo papilloso, apiculis brevissimis tantum exsertis; fructibus sphaeroideis, ca. 7 mm longis, 5 mm diam.; semine 1, ca. 5 mm longo, 3.3 mm lato.

Slender shrub 0.1–0.3 m tall, the stems somewhat 4-angled, puberulent with spreading hairs when young; leaves opposite, subsessile, very narrow, the axillary glands deltoid, up to 1.7 mm long; petiole up to 2 mm long; blades coriaceous, linear, slightly narrowed at the base, obtusish or acutish at the apex, revolute at the margins, 3–5.5 cm long, up to 5 mm wide when spread out but mostly less than 2 mm when the margins are revolute, glabrous or puberulent along the midrib beneath, the midrib lightly raised beneath, the venation obscure; inflorescence axillary, sessile, up to 6-flowered; pedicels short, up to 2 mm long, bracteate, the bracts like the sepals but smaller, sometimes subtending the calyx; calyx glabrous or its lobes faintly puberulent-ciliate, calycine squamellae none, the calyx-lobes ovate, acutish or obtusish at the apex, 1.3–1.7 mm long; corolla greenish-white, hypocrateriform, the tube slightly swollen at the base and at the location of the stamens, about 11 mm long, essentially glabrous to variably hirtellous outside, papillose- pubescent within at the lower part; the lobes sinistrorsely contorted, oblong, obtuse, about 4 mm long, 1.7 mm broad, glabrous; stamens inserted about ¾ up the tube, the filaments 0.7–0.9 mm long, the anthers dehiscent to their base, lanceolate, sharply sagittate at the base, finely tipped at the apex, about 3.5 mm long, the basal lobes 0.6–0.7 mm long, becoming uncinate, the acumen about 0.3 mm long, glabrous; ovary syncarpous, tapering at the apex, glabrous, 2-celled, the many ovules in about 4 series in each cell; style about 1.3 mm long, the clavuncle 0.4–0.5 mm long, minutely papillate-woolly, the apiculi very short, hardly exserted; fruit a berry, spheroid, about 7 mm long, 5 mm diam.; seed one, oblong-elliptic, about 5 mm long, 3.3 mm broad.

Type: *Bassett Maguire & John J. Wurdack 34507*, Alto Río Orinoco, Territorio Amazonas, Venezuela, occasional at edge of Savanna No. 3, northwest base of Cerro Yapacana, elev. 150 m, March 17, 1953, shrub 0.1–0.3 m, flowers greenish white, fruit green (holotype NY).

L. pygmaea has an unique appearance in the genus. Its revolute-linear leaves are unlike any other in *Lacmellea*. Its flowers and fruits, however, place it unmistakably. The essential floral and fruit structure is typical, and it thus still holds that "the species of *Lacmellea* are all closely inter-related, no sectional classication being particularly desirable within the genus." (Monachino, Lloydia **7**: 282. 1944). *L. pygmaea* does not show any particular alliance with any one of the 18 known species of *Lacmellea;* in the key to the genus (l. c. p. 283; Notizbl. Bot. Gart. Mus. Berlin **15**: 618. 1941), it would fall next to *L. pauciflora* (Kuhlm.) Mgf. This *pedaneous* species is truly a dwarf in a genus comprising trees up to 30 m tall. Its striking divergence from the rest of an otherwise uniform group (although the singularity is in vegetative characters only) again emphasizes the remarkable endemism discovered in the Yapacana area.

Malouetia glandulifera Miers.

VENEZUELA: *Maguire & Wurdack 34810,* Río Casiquiare and tributaries, Amazonas, dominant plant of submerged margin of Lago Paciba, Río Paciba, elev. 130 m, April 3, 1953, slender tree 2–6 m, trunk basally swollen. COLOMBIA: *Maguire, Wurdack & Bunting 36263,* Río Atabapo, frequent in drowned river margin between San Fernando de Atabapo and Cacagual, 130 m elev., Nov 18, 1953, tree to 6 m, with tumid trunk, calyx reddish, corolla cream, "Palo" or "Volla."

The leaves of *36263* are very atypical. They are dull, thin, irregularly shaped to strongly falcate. This may be due to disease. The flowers are identical with those of *34810.* The sepals of the latter are slightly blunter than those of the isotype at The New York Botanical Garden. The corolla-limb is sparingly pilose toward the center.

Malouetia sp. nov.?

Wurdack & Monachino 41116, Río Parguaza, Estado Bolívar, Venezuela, locally frequent at savanna edge near Pilon, 5 km northeast of river mouth, elev. 100 m, Jan 5, 1956, tree 8 m with white latex, fruit green.

Tree about 8 m tall, the branchlets dark brown; leaves opposite, drying green, shining and smooth; petiole about 7 mm long; blade lanceolate, slightly asymmetric, rounded to cuneate at the base, mostly short-acuminate at the apex, 12–16 cm long, (3–) 4–6 cm wide, the secondary nerves 9–13 pairs, slightly arcuate, foveate at the axils, the middle ones ascending at an angle of about 45–50°, the reticulation of veinlets on the underside clear; axis of the infructescence short, about 1.2 cm long; sepals persistent, deltoid, about 1–1.3 mm long, puberulent outside and within; flowers lacking; follicles divaricate to reflexed, slender, slightly or hardly torulose, 12–17 cm long, 4 mm thick, glabrous; seeds subscaphiform, pale brown, about 2 cm long, 2.5 mm broad, completely covered with a dense matting of light brown wool, the hairs about 2 cm long, slightly crisped, easily rubbed off.

Unfortunately, all the plants seen were past blooming. Whereas many species of *Malouetia* are similar to each other in vegetative characters, the leaf details of the present plant could not be matched in the herbarium. The leaves dry a shade of green, somewhat yellowish, a color unusual in *Malouetia.* The habitat of the tree was unexpected; it grew in savanna margins, in association with such plants as *Piptadenia peregrina.*

Mandevilla anceps Woods.

Nine collections from Amazonas, Venezuela, are now available; from the Casiquiare (Piedra Tururumeri, Piedra Arauicaua), Cerro Sipapo, Cerro Duida, Serranía Yutaje. These were determined from the description and photo of the Spruce holotype collected "in montic. Tarurumari fluvi Pacimoni." The Casiquiare (Ríos Pacimoni-Yatua) specimens have the leaves beneath softly villose with erect, relative long hairs, whereas the other collections have a close white tomentum of very short, appressed hairs. Specimens from Colombia, Vaupés, Río Kuduyari (deposited at USNH), have leaves glabrous to softly villose beneath.

Mandevilla caurensis Mgf.

VENEZUELA: *Maguire, Wurdack & Bunting 36127*, Great Rapids of the Orinoco, Amazonas, frequent at Raudal de Atures, 10 km south of Pto. Ayacucho, 100–120 m elev., Nov 10, 1953, stout vine in low trees, flowers white, yellow in throat. *Wurdack & Monachino 39760*, Río Pargueni, Bolívar, occasional on crystalline laja 0.5 km above river mouth, elev. 100–150 m, also seen generally on all lajas at least as far as Río Suapure, Dec 10, 1955, succulent sprawling vine, corolla white, tube yellow inside. *Wurdack & Monachino 39848*, Cerro San Borja, Bolívar, abundant, elev. 100–300 m, Dec 12, 1955, corolla white, tube yellow inside; also seen on Isla Sta Elena.

The follicles of this species are now known. The mericarps are slender, bowed out but often united at the apex, lightly torulose, 16–20 cm long, 3–4 mm thick, glabrous, somewhat glaucous. The seeds are rusty colored, about 9 mm long, 1.3 mm wide, minutely hairy, the coma light cinnamon, about 1.5 mm long.

Mandevilla duidae (Woods.) Woods.

VENEZUELA: Amazonas: *Maguire & Maguire Jr. 29109*, Cerro Duida, summit of Culebra Peak, alt. 1600 m, April 22–24, 1949, flowers yellow. *Maguire, Cowan & Wurdack 29655*, Cerro Duida, Río Cunucunuma, mossy forest, ridge west of Caño Culebra, 1800 m alt., Nov 22, 1950, vine with yellow flowers. *Maguire, Cowan & Wurdack 29663*, Cerro Duida, Río Cunucunuma, open scrub, ridge west of Caño Culebra, 1800 m alt., Nov 22, 1950, vine with yellow corollas, orange outside, fruit brown-red. *Maguire, Cowan & Wurdack 29809-A*, Cerro Huachamacari, Río Cunucunuma, cumbre, 1700 m alt., Dec 4, 1950.

This species was originally described in the genus *Salpinctes*, from a fruiting specimen. It suggests a place in the neighborhood of *M. lancifolia* Woods. and *M. benthamii* (A. DC.) K. Sch. in Woodson's suggenus *Exothostemon*. The leaves are up to 12 mm wide; they have the usual glands along the midrib on the upper side. The sepals are about 3 mm long; the infundibuliform corolla has the proper tube about 3.2 cm long, the throat 2 cm long, the lobes 1.5 cm long; the anthers are 6 mm long, the ovary is slightly hairy, the nectaries are concrescent into a ring; the hairy seeds are 7 mm long, the brilliant tawny coma 2 cm long.

Mandevilla filifolia Monachino.* Figure 16.

Frutex gracilis suberectus vel scandens, latice copioso, caule argute anguloso; foliis (4–) 6– (–7)-verticillatis; petiolis minus 1 mm longis; laminis filiformibus 3–6.5 mm longis, ca. 0.5 (–4) mm latis, ad basin et apicem acutis, margine revolutis, subglabris vel subhirtellis; nervis secundariis numerosis erectis; costa glandulifera vel nuda; pedicellis fructiferis ca. 3 mm longis; lobis calycis 2 mm longis, squamellis irregularibus, nectarinis 5; fructibus gracilibus 6–11 cm longis, 3 mm latis, glabris; seminibus 8-9 mm longis, 2 mm latis, pubescentibus, coma 2 cm longa fulva.

Slender woody vine or suberect subshrub, with abundant white latex, the branches mostly alternate and sharply 6-angled, brownish-grey, minutely ver-

---

*Another species with whorled linear leaves in the subgenus *Exothostemon* has just been described, *M. annulariifolia* Woodson, Bot. Mus. Leafl. **18**: 168 (1958). Our plant has a shrubby habit and more strongly angled stems. The leaves differ considerably: they have revolute margins and manifestly expressed secondary nerves.

ruculose by the persistent bases of the short stiff hairs; leaves (4–) 6 (–7), verticillate or become subverticillate, crowded, chartaceous; petioles short, less than 1 mm long; blades filiform, acute at base and apex, revolute at the margins, 3–6.5 cm long, about 0.5 mm wide, or 1–2.5 (–4) mm wide when the margins are spread out, roughened with a few minute stiff hairs at the apex on the upper side, otherwise glabrous or sometimes weakly hirtellous along the midrib on the under side and elsewhere, the midrib sunken on the upper side, the secondary nerves numerous, spreading at right angles from the midrib, faint to rather pronounced, foliar glands scattered along the midrib on the upper side or lacking (not developed); flowers lacking; axis of the infructescence 4–7 cm long, the scars scattered; fruits few, usually 1 or 2, the pedicels becoming incrassate, about 3 mm long, the calyx deciduous, the lobes about 2 mm long, glabrous in age, calycine squamellae irregularly distributed; mericarps free (earlier united at the apex), erect, slender, lightly torulose, 6–11 cm long, 3 mm thick, glabrous or puberulous at the apex, the disk remaining as a low collar at the base of the fruit; seeds (not fully matured) subscaphiform, about 8–9 mm long, 2 mm broad, brownish, puberulent or densely pubescent, the coma sessile, 1–2 cm long, tawny.

Type: *J. J. Wurdack & J. V. Monachino 40975*, Río Parguaza, Estado Bolívar, Venezuela, locally frequent on Cerro Negro Peron, an E-W crystalline range on right bank of river just below El Carmen (about 50 river km from mouth), elev. 120–350 m, seen also at Piedra Mapollos, Dec 27, 1955, slender woody vine with abundant latex, fruit brown (holotype NY).

Paratypes: VENEZUELA: Amazonas: *Bassett Maguire & Celia K. Maguire 35167*, Serranía Yutaje, Río Manapiare, frequent in scrub forest on northwest ridge, elev. 1400 m, Feb 11, 1953, perennial subshrub with sharply angled stems. *B. Maguire & C. K. Maguire 35230*, Serranía Yutaje, Río Manapiare, frequent along left fork of Caño Yutaje, elev. 1250 m, Feb 12, 1953.

The type of *M. filifolia* does not show foliar glands; the seeds (fruit not fully matured) are only faintly puberulent. The collections from Yutaje, *35167* and *35230*, are more erect in habit; they clearly show glands along the midrib; the seeds are densely pubescent. Some of the leaves in *35167* are broader with secondary nerves expressed beneath and mor ascending. The difference in seed indumentum is particularly disturbing, but it seems best at present to regard it, as well as the difference in habit of the plant, glands, leaf width, venation, and hirtellousness, as mere variation. Although flowers are lacking in the present material, *M. filifolia* can be placed with almost certainty in the subgenus *Exothostemon*. Hitherto, the only species in the subgenus with verticillate leaves was *M. benthamii* (A. DC) K. Sch., easily distinguished from *M. filifolia* by its oblanceolate, broader, proportionately shorter, thicker, coriaceous leaves with obscure secondary nerves and fewer (mostly 4) in each whorl.

Mandevilla lancifolia var. **calva** Monachino, var. nov.

Haec varietas a var. *lancifolia* recedit caulibus omnino glabris, foliis latioribus, venis secundariis numerosioribus erectioribusque, et sepalis eciliatis.

Vine or reclining subshrub, the stem moderately thick, lightly angled, completely and perfectly glabrous, brown becoming grey; leaves opposite, firmly chartaceous or subcoriaceous; petiole about 5 mm long, glabrous; blade lanceolate to oblong, rounded at the base, obtuse or narrowed and minutely apiculate at the apex, 2.5–8 cm long, 0.8–1.7 cm wide, glabrous, the midrib depressed on the upper side, lightly raised beneath, the secondary nerves numerous, spreading at a right angle with the midrib, straight, 50–70 pairs, fine, rather light, not raised, sometimes forking near the margins of the leaf, the tertiaries obscure or faint, foliar glands distributed along the upper side of the midrib; inflorescence appearing axillary or subterminal, racemoid, 5–12-flowered, the peduncle up to 4.5 cm long; bracts ovate, 1–1.3 mm long, glabrous; pedicel up to 3 mm long; sepals ovate-oblong, obtuse or slightly acute at the apex, 1–1.5 mm long, glabrous, non-ciliate, calycine squamellae irregularly distributed; corolla infundibuliform, slightly dilated above the stamens and widening at the throat, glabrous outside, white tingled with purple-red, the infrastaminal tube about 1 cm long, relatively narrow, the suprastaminal tube about 1 cm long, the throat about 2 cm long, the lobes about 2 cm long and as wide, the corolla-tube bearded below the stamens within; anthers about 4.8 mm long, glabrous; ovary about 1 mm high, glabrous; nectaries 5, about 0.3 mm high; mericarps free (earlier united at the apex), erect, linear, lightly torulose, 6–8 cm long, glabrous; seeds subscaphiform-fusiform, about 7 mm long, 1.5 mm broad, brown, densely hirtellous, the coma about 1–1.3 cm long, dark tawny.

Type: *Bassett Maguire, John J. Wurdack & George S. Bunting 36208*, region of San Fernando de Atabapo, Territorio Amazonas, Venezuela, frequent on laja on left bank of Caño Cupueni, right bank of Río Orinoco opposite mouth of Río Atabapo, 120–130 m elev., Nov 12, 1953, weak scrambling shrub, corolla white, pink-margined (holotype NY).

Paratype: *Bassett Maguire 29263-A*, Río Atabapo, Río Orinoco, Amazonas, Venezuela, frequent, on rocks along river, 15 km above San Fernando, Oct 17, 1950, reclining subshrub or vine, flowers white tingled with purple-red. The following is probably also our variety: *Ismael Velez 2457*, Río Parguaza, Estado Bolívar, Venezuela, Rocas Altas de El Carmen, April 22, 1946, (USNH; the collection data appears in Velez's catalog and was communicated to us by Leandro Aristeguieta).

M. lancifolia var. *calva* differs from the typical variety in its completely glabrous stem, broader leaves with more numerous, erect and straighter secondaries, and in its eciliate sepals. From the Colombian *M. nerioides* Woodson, which it simulates superficially, it differs greatly in its venation.

Mandevilla leptophylla (A. DC.) K. Sch.

B. Maguire & C. K. Maguire 40020, Serra Tepequem, Rio Branco, Brazil, occasional at woodland edge, northeast slopes, elev. 850 m, Nov 22, 1954, vine, flowers yellow. *Maguire & Maguire 40288*, frontier between Territorio do Rio Branco, Brazil, and Estado Bolívar, Venezuela, occasional on rocky outcrops in savanna between Vista Geral and Serro Sabang, elev. 720 m, Dec 16–18, 1954, twining vine, flowers yellow. *Maguire & Maguire 40306*, frontier between Territorio do Rio Branco, Brazil, and Estado Bolívar, Venezuela, occasional on Serra Sabang, elev. 1650 m, Dec 16–18, 1954, twining vine, flowers bright yellow.

The leaves have been described as finely puberulent beneath. Those of *40288* are pilose-tomentulose beneath, but those of *40020* and *40306* are almost glabrous.

Mandevilla surinamensis (Pulle) Woods.

VENEZUELA: Bolívar: *Wurdack 34386*, Cerro Bolívar, infrequent above Tunnel #5, elev. 750 m, Feb 25, 1953, vine in shrubs, corolla white with pink eye. *Maguire 35805*, frequent on iron ore body at El Pao, May 1, 1953, vine, flowers white, pink-flushed. *Maguire, Wurdack & Bunting 35922*, occasional on upper slopes of Cerro Toribio, elev. 450–500 m, Oct 22, 1953, woody vine in shrubs, corolla white with pink throat.

The seeds of this species are now known. Follicles glabrous, about 10–15 cm long, 3 mm thick; seeds brown, minutely hispidulous, about 7 mm long, the coma pale tawny, about 2.5–3 cm long.

Mandevilla turgida Woods.

VENEZUELA: Amazonas: *Maguire, Cowan & Wurdack 30675,* Cerro Yapacana, Río Orinoco, occasional, cumbre, 1200 m alt., Jan 3, 1951, woody vine, flowers yellow with corolla-tube base and outside orange. *Cowan & Wurdack 31068*, Serranía Parú, Río Parú, Caño Asísa, Río Ventuari, infrequent, west rim in cumbre, sabanita just north of head of valley of Camp Caño, sabanita and scrub forest, 2000 m alt., Feb 2, 1951, unbranched shrub 0.2–1 m tall, corolla yellow with outside of tube bronze. Bolívar: *Maguire 32762,* Cerro Guaiquinima, Río Paragua, frequent, rocky elevation, Cumbre Camp, 2000 m alt., Dec 25, 1951, subshrub to 7 dm high, flowers yellow. *Maguire 32949,* Cerro Guaiquinima, Río Paragua, frequent in thickets and open savanna, North Valley, 1600-1700 m alt., Jan 4, 1952, shrub or scandent vine, 5–10 dm high, flowers yellow.

The collections from the type locality, *32949* and *32762*, were compared with the type (flowers poor) at USNH. The leaves vary from elliptic to obovate, from typically acutish at the apex to rounded. The proper tube (infrastaminal quinima collections. The tube proper is about 2 cm long, the throat 1.7 cm long, The ovary is sparsely hairy. The collection *31144* is a large-flowered form. The corolla is larger than described for the species or those of the Maguire Guaiquinima collections. The tube proper is about 2 cm long, the throat 1.7 cm long, the corolla-lobes 1.5 cm. The collection from Yapacana, *30675*, differs somewhat from the typical form; stem not as densely pubescent; leaf-blades obovate, acutish at the base and running into the petiole; sepals smaller and blunter, 1 mm long, rounded to obtuse at the apex; ovary puberulent. The leaves of *31068* are sometimes ternate.

Mesechites acutisepala Monachino, sp. nov. Figure 16.

Frutex scandens gracilis; foliis oppositis chartaceis non nitidis; petiolis 5–15 mm longis; laminis lanceolatis, 4.5–11 cm longis, 1.5–3 cm latis, ad basin obtusis vel subrotundatis, ad apicem acuminatis; nervis secundariis principalibus utroque 10–15 paene rectis, prope marginem arcuatis; venis tertiariis obscuris, glandulis ad basin laminae 2 vel 4, pectinatis; floribus aggregatis; pedicellis usque ad 6 mm longis; lobis calicis lanceolatis ca. 4–5 mm longis, ad apicem angustatis acutisque; tubo corollae 1.5 cm longo (floribus nondum expansis), extus glabro, intus insertio staminum pubescenti; lobis corollae (in alabastro) 4.5 mm longis; staminibus ca. medio tubi corollae insertis; antheris 4 mm longis glabris, lobis basilaribus obtusis; ovario glabro; nectarinis 5.

Slender vine, the stem glabrous or sparsely puberulent-hirtellous, moderately lenticelled, the nodular appendages inconspicuous, deltoid, less than 0.5 mm long, easily lost; leaves opposite, chartaceous, dull; petiole 5–15 mm long, channelled above; blades lanceolate, obtuse to subrounded at the base, acuminate at the apex, 4.5–11 cm long, 1.5–3 cm wide, faintly puberulent along the midrib, the principal secondary nerves about 10–15 pairs diverging from the midrib almost at right angles and straight for a considerable distance before arching near the margins, tertiaries faint; glands at the base of the blade 2 or 4, pectinate, conic,, up to 1 mm long; flowers greenish, clustered at the apex of an axillary peduncle 2–9 cm long, the pedicel up to 6 mm long; calyx-tube about 1.7 mm long, squamellae within at the apex to about halfway down the tube, the calyx-lobes oblong or deltoid-lanceolate, narrowed and acute at the apex, 4–5 mm long, ciliolate; corolla pale pink below, salverform, the throat slightly dilated, the tube 1.5 cm long (flowers not expanded), glabrous outside, pubescent at the insertion of the stamens within, the corolla-lobes dextrorsely contorted, 4.5 mm long (in bud); stamens inserted at about middle of the corolla-tube, the anthers 4 mm long, glabrous; nectaries 5, concrescent at the base.

Type: *Bassett Maguire, R. S. Cowan & John J. Wurdack 29488*, Río Cunucunuma, Rio Orinoco, Amazonas, Venezuela, at landing, Playa Alta, Nov 9, 1950, vine, flowers greenish, lower one-third of corolla pale pink (unicate, NY).

M. acutisepala is characterized by the acute lobes of the calyx and the straight wide-spreading secondary nerves. The only other known South American species with acute sepals is the Colombian *M. citrifolia* (H.B.K.) Woodson. The leaf texture in *M. acutisepala* is thinner, the secondaries spread at a wider angle and are not barbate at the axils, the tertiaries are fainter, the leaf base is not subcordate; the calyx is obviously much larger than that of *M. citrifolia.* Our species more probably developed from the widely distributed variable *M. trifida* (Jacq.) Muell.-Arg.; it is easily distinguished from it by the acute calyx-lobes and the more erect and straight secondary nerves.

Microplumeria anomala (Muell.-Arg.) Mgf.

Bolívar: *Wurdack & Monachino 39902,* drowned margins of Río Horeda 1–4 km above mouth, elev. 90 m, Dec 15, 1955, shrub 3 m, latex white, scanty, leaves mostly 3-whorled, sometimes opposite, flowers dull white.

It is interesting to have discovered the genus in Venezuela. The type was collected by Spruce near Manáos, Brazil. The species has also been collected in the state of Pará. The leaves of the Venezuelan plant are somewhat less narrowed at base and apex, but the plant is surely this species.

Odontadenia cognata (Stadelm.) Woods.

Amazonas: *Maguire & Politi 28627,* Cerro Sipapo (Paráque), mixed montane forest, trail from Base Camp, Jan 25, 1949, liana, flowers yellow. *Maguire, Wurdack & Bunting 36331,* Río Guainía, frequent in sabanita along Yavita-Pimichín trail near Pimichín, 120–140 m elev., Nov 22, 1953, woody vine in low trees, flowers yellow marked with orange in throat.

The corolla of *28627* is much less puberulent than usual, but the indumentum is variable in density in the flowers of the same collection. The calyx-lobes are up to 8 mm long, the calyx-lobes of *36331* are up to 6 mm long. It is doubtful that *O. cognata* is specifically different from *O. verrucosa* (R. & S.) K. Sch. ex Mgf. The difference between the two seems to be a trivial one in calyx size. *O. sprucei* (Muell.-Arg.) K Sch., placed in the synonymy of *O. verrucosa* by Woodson, has the stamens (isotype at NYBG) inserted at the base of the corolla-throat, where the tube begins to dilate; this character would refer the species to *O. puncticulosa* (A. Rich.) Pulle in Woodson's treatment. *O. boliviana* Rusby (Mem. Torrey Club **6:** 76. 1896. Type: *Bang 1687,* Tipuani-Guanai), which was overlooked by Woodson, also seems to belong with *O. puncticulosa.*

Odontadenia funigera Woods.

Amazonas: *Maguire, Wurdack & Bunting 36517,* Casiquiare, occasional along Río Yatua above mouth of Río Yacibo, 100–140 m elev., Dec 4, 1953, woody vine, flowers yellow.

The specimen was compared with an isotype which was collected at Manàos, Brazil. The calyx-lobes are up to 6 mm long, ciliate, essentially glabrous in the upper part; corolla almost glabrous outside, the throat up to 2.5 cm in diameter (pressed); stamens inserted below the dilation of the throat, the anthers hairy dorsally; ovary sparsely hairy or glabrous; leaf-blades up to 17 cm long and 8 cm broad. It remains to be seen what relationship this species holds with its close allies which at present are mostly known from only single collections.

Odontadenia glauca Woods.

Amazonas: *Maguire, Cowan & Wurdack 30580,* Cerro Yapacana, Río Orinoco, infrequent, Savanna No. 3, Jan 1, 1951, vine, flowers yellow. *Maguire & Wurdack 34568,* Alto Río Orinoco, locally occasional in tree "island" in Savanna No. 3, northwest base of Cerro Yapacana, elev. 150 m, Mar 17, 1953.

The fruit of this species is now known. The follicle is 8 cm long, about 4 mm broad; seeds brown, elliptic-lanceolate, short-beaked at the apex, 1.5 cm long, 2.7 mm broad, glabrous (microscopically papillose), rugolose. The seeds appear to be ecomose; no coma was found within the follicle! The calyx-lobes are up to 2 mm long.

Paralyxia macrophylla (Muell.-Arg.) Mgf. Figure 15.

Forest Department of British Guiana Field No. Guppy 479, Record No. 7494, headwaters of Río Trombetas, Brazil, at the British Guiana frontier, Uranwau, riverside, alt. 1000 ft, Oct 22, 1952, semi-prostrate tree with three stems, 8″ × 40′, pale yellowish bark, pale yellow slash and wood, white milk, leaves light green, arranged in a spiral near twig ends, flowers white, in subterminal axillary cymes, fruit flat, ear shaped, 2″ long.

The monotypic genus *Paralyxia* has until now been represented in herbaria only by the Schomburgk type collection made over a hundred years ago on the Tenette hills by the river Takutu in British Guiana. The affinity of this genus has been under discussion (Markgraf, Notizbl. **13**: 456–59. 1937). Fortunately, the fruit has now for the first time become available; it suggests a strong link with *Aspidosperma,* the genus under which the species was originally described. The single mericarp I have before me is a dry dehiscent compressed follicle, almost circular in shape, broadly reniform or ear-shaped, 4.7 cm long, 4 cm wide, 3–6 mm thick, smooth and glabrous; its shallow sinus is about 12 mm across; the curved ridge, which arches over the sinus forming a crescent area on each valve, is 5 mm from the margin at its widest point. The seeds are 4 in number, orbicular, 3.5 cm in diameter, very thin but not papery-winged; the embryo is centrally located, the funiculus is 1.7 long; the cotyledons are coated by a membranous-thin endosperm, orbicular, about 15 mm in diameter, cordate with an open sinus at their base; the radicle is oblong-ellipsoid, about 3 mm long, 1.3 mm thick, slightly surpassing the lobes of the cotyledons. The fruit and seeds are not essentially different from those of *Aspidosperma.* The flowers also are similar to those of that genus. They do not have, however, the clefts behind the anthers described for *Aspidosperma* by Woodson (Ann. Missouri Bot. Gar. **38**: 124–125. 1951) and suggested as "a rather precise morphological criterion to separate" it from other closely related genera. G. Erdtman examined the pollen grains of *479* and reported that they seem to be very similar to those of *Aspidosperma cylindrocarpon,* the only species of *Aspidosperma* in his collection.

Prestonia acutifilia (Benth. ex Muell.-Arg.) K. Sch.

Colombia: *Maguire & Wurdack 34991,* Río Negro, along river between Piedra Cucuy and Santa Rosa, elev. 100 m, Apr 11, 1953, woody vine, flowers pale yellow. VENEZUELA: Amazonas: *Maguire, Wurdack & Bunting 36101,* Great Rapids of the Orinoco, in low moist savanna near Palomal, near river 15 km south of Pto. Ayacucho, 100–120 m elev., Nov 9, 1953, vine in low shrubs, flowers sulphur yellow. *Maguire, Wurdack & Bunting 37529,* Casiquiare, occasional along Río Yatua near Laja Catipan, 100–140 m, Feb 6, 1954, vine climbing on low trees, flowers sulphur yellow, the throat ring whitish with 5 orange bars. Bolívar: *Wurdack & Monachino 39870,* Río Orinoco, occasional in Isla Sta. Elena, opposite mouth of Río Pargueni, elev. 80–90 m, Dec 13, 1955, plant without latex, flowers pale yellow. *Wurdack & Monachino 39976* Río Orinoco, Laja Caruto, east bank of river just below Raudal Marimare, elev. 80–90 m, Dec 18, 1955, herbaceous vine on shrubs, latex none, corolla pale greenish yellow. BRAZIL: *Cowan 38279,* Serra do Navio, Amapá, Rio Amapari, forested slopes of Observatorio Ore Body, ca. 275 m alt., Nov 12, 1954, vine over secondary growth, flowers pale yellow, fruit green.

The first three collections cited above have the leaves of a firmer texture than is usual for the species, suggesting *P. cayennensis* (A. DC.) Pichon. The anthers are glabrous on the back, not reaching up to the faucal annulus; the epistaminal appendages are short. The mericarps (*34991*, *37529*) are, as in *P. acutifolia*, typically agglutinated and puberulent, unlike those of *P. cayennensis*. *P. acutifolia*, as interpreted at the present time, has a vast range, extending from Central America or Mexico to Argentina. It is quite variable, and its limits of morphological variation are not clearly defined. There is a likelihood that it will eventually be submerged in *P. quinquangularis* (Jacq.) Spreng., for the characters invoked to separate the two are not too convincing. Incidentally, the NYBG sheet (flowers poor, corolla lacking) of *Maguire & Fanshawe 23351* from the Kaieteur Plateau in British Guiana, cited as *P. perplexa* Woods. in Bull. Torrey Club **75:** 556 (1948), appears to be *P. cayennensis*. In previous works, *Echites leptoloba* Stadelm., originally described from the Rio Negro in Brazil, has been curiously placed in the synonymy of *P. agglutinata* (Jacq.) Woods., an Haitien species that has never been reported from South America. The description of Stadelmeyer's species better suggests *P. acutifolia*.

Rhabdadenia macrostoma (Benth.) Muell.-Arg.

Wurdack & Monachino 41391, Apure, occasional in riverine tangle between Río Orinoco and Piedra La Villa (opposite Raudal Marimare), elev. 80–90 m, Jan 27, 1956, herbaceous vine with white latex, flowers brilliant red.

The seeds of this species are now known. They are light brown, glabrous (microscopically puberulent), terete-linear and gradually tapering to a triangular beak, 2.3 cm long, 1.3 mm broad, the beak about 0.3 mm thick near the apex, the coma silky pale-tawny, about 3 cm long. The plant cited above is almost glabrous; the sepals are erect, up to 5–7 long. The material identified as *R. pohlii* Muell.-Arg. from north of the Amazon basin is hardly specifically different from our plant. The pilosity of the plants and even the length of the sepals, characters used to distinguish this species, are not reliable. For example, one of the two sheets at The New York Botanical Garden of *Rusby & Squires 20* (lower Orinoco, Sacupana), cited as *R. pohlii* by Woodson, contains a specimen with a glabrous stem, the other a stem clearly pilose. The sepals are up to 10 mm in length. It is likely that the pilose material corresponds to *R. macrostoma α pubescens* Muell.-Arg. (Linnaea **30:** 435. 1860), a name not accounted for in Woodson's monograph.

BIGNONIACEAE[23]

This is my twenty-second contribution to the study of the tropical American representatives of the family (see Mem. N. Y. Bot. Gard. 9: 359. 1957). As before, the taxa are arranged alphabetically, both by genera and species.

Arrabidaea tuberculata DC.

VENEZUELA: Estado Bolívar: large woody vine, young leaves canescent beneath, flowers rose-purple, canescent, Río Parguaza, locally frequent along river just below Raudal Maraca (about 110 river km from mouth), 115 m, fl. Dec 1955, *J. J. Wurdack & J. V. Monachino 40990.* Colombia, Guiana, Amazonian Brazil and Peru. First record for Venezuela.

Cremastus lachnaeus Bur. ex Bur. & K. Schum.

VENEZUELA: Estado Bolívar: woody vine climbing on trees up to 18 m, flowers brilliant purple-red, Río Parguaza, locally frequent at savanna margins near Pilon, 5 km northeast of river mouth, 100 m, fl. Jan 1956, *J. J. Wurdack & J. V. Monachino 41132.* Brazil. First record for Venezuela.

Jacaranda orinocensis Sandwith, sp. nov.

Sect. *Monolobos* DC., *J. hesperiae* Dugand atque *J. caucanae* Pittier ob calycem corollamque affinis ab ambabus habitu humili, foliorum pinnis necnon foliolis paucioribus, inflorescentia ramulos hornotinos terminante, ovario glabro differt.

Frutex vel arbor parva, 3 mm altus; ramuli hornotini lenticellis cremeis notati, parce minute lepidoti, pilis perpaucis hyalinis minutis apice glanduliferis praediti, ceterum glaberrimi. *Folia ramulorum inflorescentias gerentium* imparibipinnata (rarius simpliciter imparipinnata, foliolis distincte petiolulatis), internodiis rhacheos 2–5 cm longis supra canaliculato-marginatis exalatis fere glabris, pinnis 3–9-jugis; foliola imparipinnatim 3–6-juga vel in pinnis imis summisque 1–2-juga vel etiam solitaria, rhombeo-oblonga vel obovato-oblonga vel obovata, lateralia apice acuta vel obtusa usque rotundata cuspidatula basi cuneatim attenuata obliqua inaequilatera subsessilia vel plus minusve distincte (ad 5 mm) petiolulata, 0.5–3.5 cm longa, 0.3–1.6 cm lata, terminalia vulgo majora elliptica vel nonnunquam suborbiculari-elliptica utrinque acuta vel apice breviter acute acuminata vel rotundata, ad 3.5 cm longa, ad 2.5 cm lata, omnia chartacea, infra pallida glaucescentia, fere glabra sed supra secus nervos minute puberula atque subtus basin costae versus saepe pilosula, nervis venulisque supra planis vel impressis subtus prominulis. *Folia ramulorum sterilium* maxima, fere glabra, 40–45 cm longa, 30–40 cm lata, paribipinnata, internodiis rhacheos 4–6.5 cm longis subteretibus exalatis supra peranguste vix obvie nec profunde canaliculatis, pinnis 6–jugis; foliola imparipinnatim 3–9-juga, lateralia trapezoideo-oblonga apice acuta mucronata basi acuta cuneatim attenuata, subsessilia vel distincte ad 3 mm petiolulata, 2–4 cm longa, 1–1.8 cm lata, terminalia lanceolato-elliptica apice conspicue acuminata basi longe attenuata ad 5.5 cm longa ac ad 2 cm lata, ceterum iis sub inflorescentiis dispositis similia sed rigidiora. *Inflorescentia* apice ramulorum hornotinorum terminalis, in exemplis visis 5–12 cm longa, 6–9 lata, velut ramuli minute parcissime lepidota ceterum glabra; bracteae primariae foliaceae anguste elliptico-lanceolatae vel lineari-spathulatae petiolatae, ad 1.3 cm longae, 1.5–3 mm latae, superiores gradatim breviores; pedicelli ad 5 mm longi, saepe cernui. *Calyx* saltem ad medium vulgo ultra medium divisus, extra parce inaequaliter lepidotus ceterum glaber; lobi oblongi, spathulato-oblongi vel triangulari-lanceolati, apice acuti vel obtusi, 3.5–5 mm longi,

---

[23] By N. Y. Sandwith.

1.5–2 mm lati, nonnunquam breviores deltoideo-triangulares acuti 1–1.5 mm tantum longi. *Corolla* purpurea, ad 3.5 cm longa, saepius curvata; tubus basi more generis circa ovarium inflatus, tum breviter anguste cylindricus ac extra pilis crebris papilliformibus rectis hyalinis apice glanduliferis praeditus, tum campanulato-infundibuliformis ac apice circiter 1.5 cm latus extra glabrescens ac oculo nudo glaber, intus zona lata pilorum sub staminum insertione excepta glaber; limbus expansus circiter 2.3 cm diametro, lobis circiter ad 8 mm longis et 1.2 cm latis longe conspicue ciliatis. *Stamina* circiter 8 mm supra tubi basin inserta, longiora 1.3–2 cm breviora 1.1–1.7 cm longa; filamenta basin versus pilis brevibus rectis hyalinis glanduliferis iis zonae sub insertione staminum similibus praedita; antherarum theca fertilis 2–2.2 mm longa, sterilis ad 0.75 mm longa; staminodium 2.7–3 cm longum, inferne glabrum, prope medium et apicem claviformem versus pilis longis flexuosis apice glanduliferis barbato-villosum, dimidio superiore glabrescens sed linea glandularum sessilium vel subsessilium praeditum. *Discus* pulvinaris, ad 1.2 mm altus, ovario multo latior. *Ovarium* ovoideum, glabrum, vix 1.5 mm diametro; stylus glaber, stigmatibus inclusis ad 2.5 cm longus. *Fructus* valde immaturus tantum visus, apice rotundatus.

Type: VENEZUELA: Estado Bolívar, Río Pargueni, Río Orinoco, frequent at river edges 1–10 km above mouth, alt. 90 m, tree 3 m, fls. purple, Dec 10, 1955, *J. J. Wurdack and J. V. Monachino 39769* (holotype NY, isotype K).

VENEZUELA: Estado Apure: Río Cinaruco, Río Orinoco, locally frequent between mouth and Las Galeras de Cinaruco, alt. 80–90 m, shrub 3 m, fls. purple, Jan 25, 1956, *id. 41365* (NY, K).

The large leaves of sterile shoots, which I have described above and which, it is interesting to note, retain the small number of pinnae, were taken from a single example of the "population" from which the flowering specimens of no. 39769 were collected. Dr. Wurdack writes that "the plants of 39769 were very abundant along the Pargueni, but were flowering sporadically, so the collection number probably represents at least 6 different plants."

The two collections are not uniform, no. 41365 showing leaves with more numerous pinnae and shorter calyx lobes than those of 39769, but I am confident that they represent a single entity which is of interest because of its apparent relationship in floral characters with two species, *J. hesperia* and *J. caucana*, and especially the former, with a very different distribution in Colombia (see Dugand, Mutisia **23**: 1-11. 1954). The other somewhat similar species of sect. *Monolobos*, *J. obtusifolia* H. & B. which, with its vars. *obtusifolia* and *rhombifolia*, is well known in the Orinoco basin, is at once distinguished from *J. orinocensis* by the numerous leaflets of the usually more numerous pinnae, by the inflorescence arising from old wood, the shortly deltoid teeth of the calyx, and the absence of glandular hairs on the outside of the corolla tube towards its base.

Lundia densiflora DC.

VENEZUELA: Estado Bolívar: woody vine, corolla white with pale yellow tube, completely white with age, Río Parguaza, occasional on crystalline laja along river 2 km below Raudal Maraca (about 110 river km from mouth), 120–150 m, fl. Dec 1955, *J. J. Wurdack & J. V. Monachino 41026*. Colombia; Guiana, Amazonian Brazil. First record for Venezuela.

Memora flaviflora (Miq.) Pulle, forma.

VENEZUELA: Estado Bolívar: woody vine climbing 18 m on trees, calyx greenish, corolla yellow-orange, Río Parguaza, locally frequent on river banks 1–3 km above El Carmen (about 50 river km from mouth), 110 m, fl. Dec 1955, *J. J. Wurdack & J. V. Monachino 40950*. Guiana. First record for Venezuela.

This is a form of the species with the veinlets of the leaflets more intricately and more prominently raised.

Pleonotoma dendrotricha Sandwith, sp. nov.

P. variabili (Jacq.) Miers affinis, sed indumento denso pilorum parvorum ramosorum stellatiformium secus ramulos folia inflorescentiasque conspicuo, praeterea ovulis pro loculo 6-seriatis differt. *P. tetraquetra* (Cham.) Bur., Brasiliae australis incola, quae ovula pro loculo 6-seriata etiam praebet, indumento simili sed e pilis multo majoribus constituto gaudet, praeterea foliis semper triternatis lobis corollinis majoribus differt.

Frutex ope cirrhorum scandens; ramuli siccitate brunnei, pilis parvis furfuraceis ramosis dendroideis stellatiformibus dense induti; pseudostipulae haud foliaceae, lineari-spathulatae, apice glanduliferae. *Folia* biternata, petiolo rhachi pinnarum petiolulis siccitate brunneis indumento ramulorum subtomentosis; petiolus 1.5–2 cm longus; pinnae binae trifoliolatae ad 13 cm longae; petioluli laterales circiter 5 mm longi, terminales ad 1.8 cm longi; foliola pinnarum inaequalia, lateralia terminali minora, omnia chartacea, utrinque sed praesertim subtus indumento dendroideo stellatiformi pubescentia, subtus quidem mollia subvelutina, supra etiam lepidoto-punctata, costa nervisque supra subplanis tenuissime prominulis subtus prominentibus, supra intricatissime rugosulo-subasperula. *Racemi* breves, circiter ad 2 cm longi, ubique eodem indumento subtomentosi; pedicelli vix usque ad 1 cm longi; bracteae pleraeque circiter 1 mm longae, imae tantum longiores. *Calyx* tubuloso-campanulatus, 7–8.5 mm longus, apice ad 7 mm latus, dense minute pubescens vel demum fere glabrescens, sub apice brevissime denticulato plus minusve incrassato-verrucosus atque glandulas gerens. *Corolla* teste lectore alba, anguste campanulato-infundibularis, 5–6 cm longa, limbo siccitate ad 2.8 cm diametro; tubus parte basali anguste cylindrica 1.5–1.8 cm longa, apicem versus ad latitudinem 1.5–1.7 cm ampliatus, extra nisi sub lobis glaber, intus zona lata pilorum sub insertione staminum praeditus; lobi majores circiter 1.3 cm longi, 1.2 cm lati, omnes utrinque pilis ramosis furfuraceis pubescentes praeterea glanduloso-lepidoti. *Stamina* circiter 1.5 cm supra tubi basin inserta, glabra, longiora circiter 2.4 cm breviora 1.7 cm longa, thecis antherarum divaricatis 3.5 mm longis; staminodium 4 mm longum. *Discus* pulvinari-cupulatus, fere 1.5 mm altus. *Ovarium* ovoideo-oblongum, 1.5 mm latum, crassum, plusminusve costatum sulcatumque, lepidotum; stylus circiter 3 cm longus, conspicue sulcatus; ovula plurima (ultra 80), in quoque loculo 6-seriata. *Capsula* lineari-oblonga, c. .45 cm longa, ad 1.7 cm lata, minute dendroideo-pubescens atque lepidota, praeterea glandulis magnis patelliformibus immersis notata; semina omnino pallide brunnea, alis latis membranaceis, 1.2 cm longa, 4–4.5 cm lata.

Type: VENEZUELA: Territorio Amazonas, Río Orinoco, 1–10 km below San Fernando de Atabapo, 150 m. fl. May 11, 1954, *J. Silverio Level 67* (holotype K, isotype NY). "Bejuco. Flores blancas."

BRAZIL: Amazonas: Manaus, Campo Vieiralves, Adrianopolis, terra firme arenoso, capoeira aberta, fr. Oct. 1955, leg. *Chagas, Herb. Inst. Nac. Pesq. Amazônia 2095; ibid.*, estrada antigua de S. Raimundo, terra firme arenoso, capoeira fechada, fr. Oct. 1955, leg. *Chagas, Herb. Inst. Nac. Pesq. Amazônia 2211.*

This interesting plant occupies a position between *P. variabilis* and *P. tetraquetra*, having the simply biternate 6-foliolate leaves and corolla of the former, and the "dendroid" type of indumentum and 6-seriate ovules of the latter. It is worth remarking here that *P. clematis* (H.B.K.) Miers, which I have elsewhere kept separate from *P. variabilis* on the grounds of the smaller calyx and corolla and the much narrower capsule (see Fl. Trinidad & Tobago 2(5): 339), apparently differs further from that species in producing frequently, or even usually, thrice ternately pinnate leaves, whereas all the specimens I have seen of *P. variabilis* bear only simply biternate, 6-foliolate leaves with or without a tendril. The description of the fruit and seeds is taken from the Brazilian collections, which also show larger leaves with longer petioles and petiolules, and larger leaflets, becoming 5 cm wide and 10 cm long.

Stizophyllum riparium (H.B.K.) Sandw.

VENEZUELA: Estado Bolívar: woody vine climbing 10 m on trees, flowers dull greenish yellow, Río Parguaza, in forest at base of Piedra Mapollos, east bank of river about 10 km above El Carmen (about 60 river km from mouth), 110 m, fl. Jan 1956, *J. J. Wurdack & J. V. Monachino 41083*.

This species, in its narrowest sense, occurs in Panama, Colombia, and Amazonian Peru. Apparently the first record for Venezuela.

LEGUMINOSAE—MIMOSOIDEAE[24]

Calliandra pakaraimensis Cowan, sp. nov.

Arbuscula ad 2 m alta, ramulis dense albo-tomentosis; stipulae deciduae, 10–15 mm longae, 6–7 mm latae, anguste ovatae, acuminatae, externe subappresso-albo-tomentosae, intus glabrae; petiolus 7–10 mm longus, albo-tomentosus, rachibus 7–11 mm longis, albo-tomentosis; pinnae bijugatae, ellipticae, petiolis secondariis 2–2.5 mm longis, albo-tomentosis, rachibus secondariis 68–85 mm longis, albo-tomentosis; foliola sessilia, 30–36-jugata, valde approximata, angustissime oblonga, leviter falcata, apice obtusa, base oblique truncata, supra glabra, infra glauca, longiciliata, costa nulla, 4–5-nervia, utrinque nerviis prominulis, pinnarum foliolis mediis 10–16 mm longis, 2–3 mm latis, foliolis apicalibus et basalibus leviter minoribus; inflorescentiae terminales, racemosae, floribus sessilibus, capitulis ferentibus, pedunculo ca. 14–20 mm longo, albo-tomentoso, bracteis persistentibus stipularum amplitudine, externe longo-sericeis, intus glabris; calyx sericeus, 3 mm longus, 5-dentatus; corolla 8 mm longa, externe leviter sericea, lobis ca. 5 mm longis, ellipticis; filamenta ca. 20 mm longa, parte basali connata; fructus ca. 8 cm longus, leviter albo-pubescens et glanduloso-puberulus.

Type Collection: *B. Maguire, W. M. C. Bagshaw, & C. K. Maguire 40561* (holotype NY), ''shrub to 2 m tall. Fls. red. Locally common at Imbaimadai, elev. 550 m, Mt. Ayanganna, Pakaraima Mountains, British Guiana, Feb 1, 1955.''

This is the second species of this general relationship from British Guiana; the other one is *C. rigida* which has very different leaves and vestiture, and the flowers are much smaller. The assemblage to which both species belong is chiefly southeastern-Brazilian, but a related species (*C. tsugoides*) from Venezuela is described below. It is more like *C. rigida,* in respect to the flowers at least, than the species described here.

Calliandra pilosifolia Cowan, sp. nov.

Arbor 4 m alta, ramulis dense pilosis, mox glabrescentibus; stipulae 8–10 mm longae, 1.5–2 mm latae, lanceolatae, acutae, pilosae, striatae; petioli 10–15 mm

---

[24] Richard S. Cowan.

longi, pilosi; pinnae unijugatae, petiolo secondario 4–7 mm longo, piloso, rachibus secondariis 25–40 mm longis, pilosis; foliola 1.5-jugata, 2-nervia (nerviis utrinque prominulis), ciliata, supra leviter pilosa, infra pilosa praecipue in nerviis, jugorum superiorum foliolis ellipticis, falcatis, longo-acuminatis, base latere inferiore cordato sed latere superiore acuto, 10.5–15 cm longis, 3.5–7 cm latis; jugi inferioris foliolum plus minusve ovale vel late ellipticum, acutum, base obtusum, 4.5–7 cm longum, 2–4.5 cm latum; inflorescentiae capitatae, pedunculo 20–30 mm longo, sparse pilosulo, floribus sessilibus; calyx 2 mm longus, glaber, striatus; corolla sparse minuto-strigulosa, 10 mm longa, lobis ca. 1.5 mm longis; filamenta 45 mm longa, tubo 14 mm longo connata; gynoecium et fructus ignotus.

Type Collection: *B. Maguire & L. Politi 28629* (holotype NY), "tree 5 m high, petals white, stamens pink. Mixed montane forest along trail from Base Camp, 125 m, Cerro Sipapo, Terr. Amazonas, Venezuela, Jan 25, 1949."

Paratypes: same data, and collectors, *28421*; mixed montane forest near Intermediate Camp, 600 m alt., Cerro Sipapo, Feb 2, 1949, *Maguire & Politi 28721*; at edge of open area on Piedra Tururumeri, elev. 150 m, Ríos Pacimoni-Yatua, Yatua, Casiquiare, Feb 4, 1954, *Maguire, Wurdack, & Bunting 37510*.

The nearest allies of this very distinctive plant are two Ecuadorian species, *C. glyphoxylon* and *C. subnervosa*. The latter has smaller, somewhat differently shaped leaflets with different vestiture, smaller flowers, etc. *C. glyphoxylon* has shorter petioles, less exserted staminal tube, differently shaped leaflets with less pubescence on them, as well as on the other vegetative parts.

Calliandra stipulacea Benth.

This wide-ranging species occurs frequently through the interior of Venezuela (Ciudad Bolívar southward), northernmost Brazil, southeastern Colombia, and perhaps eastern Brazil. As with so many legumes having such a diffuse range, there is considerable variation in some of the morphological characters; in this species it is the vestiture of the leaflets which is most variable. Typically the leaflets are glabrous but not infrequently either the upper or the lower, or both surfaces, are variously pubescent. There does not appear to be any discontinuity in the pattren, however, and there is no geographical correlation with the morphological variation.

The following recent collections exhibit some of this instability:

BRAZIL: Terr. do Rio Branco: occasional, overhanging river above falls, elev. 550 m, Serra Tepequem, *Maguire & Maguire 40172*; Vista Geral, Rio Cotinga, elev. 720 m, *Maguire & Maguire 40199, 40263*.

Calliandra tsugoides Cowan, sp. nov.

Arbuscula 6–10 m alta, ramulis leviter albo-pilosis; stipulae deciduae, ca. 5 mm longae, 1 mm latae, lineari-lanceolatae, obtusae, externe strigulosae, intus glabrae; petioli 5–6 mm longi, parce pilosuli, rachibus 12–30 mm longis, sparse pilosulis; pinnae 2–4-jugatae, anguste ellipticae, petiolis secondariis 2 mm longis, sparse pilosulis, rachibus secondariis 60–80 mm longis, sparse pilosulis; foliola sessilia, 35–45-jugata, valde approximata, angustissime oblonga, leviter curvata, apice rotundato-obtusa, base truncata, supre valde nitida, infra glabra, ciliolata, costa nulla, 3-nervia, utrinque nerviis prominulis, pinnarum foliolis mediis 7–12 mm longis, 1.5–2 mm latis, foliolis apicalibus et basalibus plus minoribus; inflorescentia capitata, terminalis et in axillis foliorum superiorum, pedunculo 17–27 mm longo, albo-pilosulo et glanduloso-puberulo, floribus sessilibus, perianthio externe sericeo, intus glabro; calyx cupularis, ca. 2 mm longus, 4-dentatus;

corolla 5 mm longa, lobis ca. 3 mm longis, ovatis, acutis; filamenta basi solum connata, ca. 40 mm longa; ovarium lineare, puberulum, lateraliter unisulcatum; fructus ca. 75 mm longus, 10 mm latus, angustissime ellipticus, mucronatus, puberulus, margine incrassatus; semina oblonga, 8 mm longa, 6 mm lata, lateraliter compressa.

Type Collection: *B. Maguire, R. S. Cowan, & J. J. Wurdack 30705* (holotype NY), "shrub or tree to 6 m. Anthers red, with extreme base white. Perianth white with reddish tips. Frequent on cumbre and slopes of Cerro Yapacana, Terr. Amazonas, Venezuela, Jan 3, 1951." Paratypes: same data and collectors, *30633, 30671*.

The relatives of this species occur in such distant regions that they might easily be completely overlooked. The nearest, morphologically, of these is apparently *C. calycina*, but *C. hirsuticaulis* is almost as closely allied. Both species and most of their relatives are natives of southeastern Brazil. *C. tsugoides* may be distinguished from both by the number and shape of the pinnae, number of pairs of leaflets, pubescence and size of the flowers, and the length of the staminal tube. From *C. rigida*, a species of British Guiana, which appears to be similar, *C. tsugoides* differs in number and shape of pinnae, pubescence of flowers, size and persistence of stipules, etc.

Pithecellobium arenarium Ducke.

VENEZUELA: Amazonas: Caño Profundo, North Branch, elev. 1600 m, Cerro Sipapo, *Maguire & Politi 28215*; frequent shrub or small tree, rim head of South Basin, elev. 2100 m, Cerro Sipapo, *Maguire & Politi 28653*; West Rim Cumbre of Serranía Paru, elev. 2000 m, *Cowan & Wurdack 31242, 31243, 31335*; spreading tree 3 m, woodland between Savanna No. 3 and Gold Mine Camp, northwest base of Cerro Yapacana, 125 m elev., *Maguire & Wurdack 34558*.

There are few leguminous plants atop the sandstone tepuis of the Guayana Highland and this is by far the most wide-ranging of these. It was originally described from the vicinity of Manáos and if its occurrence in the Highland seems incongruous, it may be conjectured that seeds may have been distributed to the lowlands by some natural agent. Morphologically, there is little doubt of the identification of these collections, there is some variability in the amount of pubescence on the leaflets but it appears to be in a continuous pattern.

Pithecellobium guachapele (H.B.K.) Cowan, comb. nov.

Acacia guachapele H.B.K. Nov. Gen. & Sp. **6**: 281. 1824.

Several recent collections have been referred to this species and for those who do not recognize the generic segregates in this complex, a combination under the aggregate generic name is desirable. Certainly some of these segregates are useful as subgeneric units, but most of them are very questionably retained as distinct genera.

Stryphnodendron levelii Cowan, sp. nov.

Arbor 8 m alta, ramulis juvenilibus granulari-puberulis, glabrescentibus; petioli 30–35 mm longi, granulari-puberuli, prope apicem glandula elliptica ferente, rachibus 35–45 (–65) mm longis, parce granulari-puberulis, prope apicem glandula rotunda ferente, petiolo secundario 5–8 mm longo, sparse puberulo, rachibus secondariis 40–60 mm longis, sparse puberulis; pinnae 3–4-jugatae, foliolis 8–9-jugatis, alternis, petiolulo 0.5–1 mm longo, sparse pilosulo; foliolorum laminae chartaceae, valde discoloratae, glabrae (ad costam basaliter villosae

exceptis), oblongae (jugo terminali late obovato), 10–16 mm longae, 7–10 mm latae, apice rotundatae, basi obtusae et inaequilaterales, supra costa et venis obscuris, infra prominulis; inflorescentiae axillares, spicatae, spicis ca. 10 mm diametro, pedunculo 18–20 mm longo, leviter puberulo, axe 50–75 mm longo, puberulo; calyx cupularis, ca. 0.7 mm longus, puberulus; corolla 1.5 mm longa, puberula, lobis 0.8 mm longis, acutis; filamenta 4.5–5 mm longa, glabra; pistillum fructusque ignotus.

Type Collection: *J. Silverio Level 104* (holotype NY), "arbol 8 m. Flores amarillas." Caño Guazuriapana, Río Atabapo near San Fernando de Atabapo, elev. 150 m, Terr. Amazonas, Venezuela, May 16, 1954.

S. levelii is perhaps most closely allied to *S. purpureum* from which it differs by having many fewer pairs of pinnae and leaflets (these somewhat different in shape and almost glabrous) and shorter inflorescences of pubescent flowers.

The new species is named in honor of the collector, who has for many years been a very important member of the expeditions from the New York Botanical Garden to Venezuela. He is usually in charge of navigation on the rivers, but, in addition, he has acted as cook, he has cut trail, and, most important, he has become an excellent botanical collector and a staunch friend.

Stryphnodendron purpureum Ducke.

"Arbol 10 m. Flores blancas." Caño Cupavén, Río Orinoco at mouth of Río Atabapo, elev. 150 m, May 11, 1954, *J. S. Level 75*.

This is the first report of this Brazilian species in Venezuela; it was previously known from the State of Pará and it has recently been collected in Amazonian Colombia (*Schultes & Cabrera 15003*).

LEGUMINOSAE—CAESALPINIOIDEAE[25]

Aldina aurea Cowan, sp. nov.

Arbor 3–4 m alta, ramulis juvenilibus glabris, valde lenticellatis; folia (1–) 3–5 (–7)-foliolata, petiolis 4–5 cm longis, appresso-puberulis, rachibus (4–) 6–11 cm longis, appresso-puberulis, petiolulis 6–7 mm longis, appresso-puberulis; foliolorum laminae 6.5–11 cm longae, 4–5 cm latae, lanceolato-oblongae, basi rotundatae paulo cordataeque, apice acuminatae, extremitate acuta, supra glabrae, infra appresso-puberulae glaucaeque (pilis aureis), facie superiore costa leviter impressa, venis venulisque obscuris, infra costa venisque salientibus, venis primariis in paribus 10– 12; inflorescentiae terminales, paniculatae, dense appresso-puberulae, bracteis bracteolisque ca. 0.8 mm longis latisque, plus minusve triangularibus, externe dense pubescentibus, intus glabris, pedicello ca. 1 mm longo; calyx externe fulvo-aureo-velutinus, intus paulo pilosulus ad apicem, 15 mm longus; petalorum lamina elliptica, cucullata, glabra, 18 mm longa, 8–9 mm lata, unguiculo 3–4 mm longo; stamina ca. 30, 15 mm longa; stylus glaber, 4.5 mm longus; ovarium dense velutinum, gynophoro 4–5 mm longo, dense velutino; fructus ignotus.

Type Collection: *B. Maguire & C. K. Maguire 35186* (holotype NY), "small tree 3–4 m high. Fls. white. Along left fork of Caño Yutaje, elev. 1250 m, Cerro Yutaje," Terr. Amazonas, Venezuela, Feb 12, 1953.

---

[25] By Richard S. Cowan.

This species is certainly related to *A. discolor* but it does not have the tessellate lower leaflet surfaces of that species and its leaves are golden-pubescent on the under sides of the leaflets (at least in youth). The leaflets of both species are glaucous on the under sides, but this characteristic is more marked in the new species. The leaflets of *A. aurea* are quite different in shape from those of *A. elliptica* (which is described below from this same mountain and to which *A. aurea* shows some relationship).

Aldina elliptica Cowan, sp. nov.

Arbor 10–25 m alta, ramulis juvenilibus appresso-puberulis; folia (1–) 3–5-foliolata, petiolis (2.5–) 4–5 cm longis, appresso-puberulis, rachibus (0–) 2.5–6.5 cm longis, appresso-puberulis, petiolulis 5–7 mm longis, appresso-puberulis; laminae 8.5–11.5 cm longae, 4–6 cm latae, ellipticae, basi rotundatae, apice obtusae et persaepe leviter retusae, supra glabrae, nitidaeque, infra appresso-puberulae glaucaeque, facie superiore costa leviter impressa, venulis obscuris, infra costa valde salienti, venis primariis paulo elevatis, in paribus 10–12; inflorescentiae terminales et in axillis foliorum superiorum, racemosae et paniculatae, aureo-sericeae, pedicellis ca. 2 mm longis; bracteae triangulares, 0.8 mm longae, externe aureo-sericeae, caducae, bracteolis deciduis, triangularibus, 0.5 mm longis, externe aureo-sericeis; alabastri umbonati, ca. 12 mm longi, aureo-sericei, calyce intus ad apicem paulo crispato-pilosulo; petala 6, oblonga vel oblanceolata, 15 mm longa, 6–7 mm lata, glabra, alba; stamina ca. 40, glabra, 15 mm longa; stylus 3–4.5 mm longus, glaber; stigma punctiforme; ovarium gynophorumque sericeum, gynophoro ca. 3.5 mm longo; fructus ignotus.

Type Collection: *B. Maguire & C. K. Maguire 35055* (holotype NY), "tree 10–25 m high. Fls. white. Dominant forest tree near Intermediate Camp, elev. 1000 m, Cerro Yutaje, Terr. Amazonas, Venezuela, Feb 4, 1953."

This distinctive species is allied to *A. discolor* but may be separated by the elliptic shape and rotund to obtuse tips of its leaflets and by its smaller petals; *A. elliptica* is characterized by evenly glaucous under sides of the leaflets, not tessellate as in *A. discolor*. In this respect the new species is similar to *A. aurea* from the same tepui; the under sides of the leaflets of the latter species are golden-pubescent and the leaflets are much different in shape.

Aldina kunhardtiana Cowan.

Tree 10 m. Fruit brown. Occasional along Río Guainía between Maroa and Victorino, elev. 125–135 m, Colombia, April 1953, *Maguire & Wurdack 35714*.

When this species was originally described, the fruits were unknown; this fruiting collection enables me to supply the following description: fruits 1–2-seeded, oblate-globose, 4 cm long, 4.5 cm wide, each valve hemispheric, finely velutinous, the pericarp ca. 8 mm thick.

Aldina macrophylla Spruce ex Benth.

Aldina yapacanensis Cowan, Mem. N. Y. Bot. Gard. **8**: 108. 1953.

The large number of recent collections of this species has made it necessary to join one of my species with an earlier one, but there is some consolation in the fact that the range of variation in the species is now much better understood. There is not a single key character used to distinguish *A. yapacanensis* which will now serve to identify it. The size of the flower-parts is especially variable in flowers of different ages; petals and ovary stipes, which are relatively small in bud, elongate enormously during anthesis and maturation of the flower. The type material of *A. macrophylla* shows mostly very large leaflets, but these recent collections indicate remarkable variability in leaflet size and shape. The following previously unreported collections represent this species.

VENEZUELA: Amazonas: along Yapacana caño from laguna to junction with Río Orinoco, elev. 150 m, *Maguire & Wurdack 34586;* spreading tree, occasional on Laja Catipan near Río Yatua, 100–140 m elev., *Maguire, Wurdack, & Bunting 37553;* tree at edge of savanna on left bank of Caño Hechimoni 8 km above mouth, Río Siapa, Casiquiare, elev. 100–130 m, *Maguire, Wurdack, & Bunting 37618;* bushy tree at edge of savanna on left bank of Caño Hechimoni 8 km above mouth, *Maguire, Wurdack, & Bunting 37620.*

Bauhinia cupulata Spreng.

VENEZUELA: Bolívar: frequent shrub 4–6 m, rocky outcrops on Isla Sta. Elena, Río Orinoco opposite mouth of Río Pargueni, elev. 100 m, *Wurdack & Monachino 39861.*

This is a rare species, described originally from southeastern Brazil and hitherto unknown so far north; it is the first report of the plant in Venezuela. It matches the type photograph well and it is surely conspecific with the Gardner collection cited by Bentham, two sheets of which are in the herbarium of The New York Botanical Garden.

Campsiandra macrocarpa Cowan, sp. nov.

Arbor 15 m alta, patula, truncis multis, ramulis puberulis; folia puberula, imparipinnata, petiolo 7–9.5 cm longo, leviter marginato, rachibus 15–24 cm longis, canaliculato-marginatis; foliola 5–6-jugata, petiolulo ca. 4 mm longo, laminis 8–19.5 cm longis, 3.5–6.5 cm latis, oblongo-ellipticis vel ellipticis, apice acuminatis, extremitate obtusiusculo, basi obtusis, leviter inaequilateralibus, utrinque puberulis, pilis erectis, supra costa subimpressa, infra salienti, venis primariis venulisque planis et obscuris supra, infra prominentibus et salientibus; fructus immaturus 36.5–59 cm longus, 6.5–7.5 cm latus, glaber, nitidus, arcuato-oblongus.

Type Collection: *B. Maguire, J. J. Wurdack, and G. S. Bunting 36472* (holotype NY), ''spreading multi-trunked tree to 15 m. Fruit green. Frequent at mouth of río Yatua. 100–140 m elevation. Nov 30, 1953.''

While it is not generally good taxonomic practice to describe new taxa on less than rather complete material, it is sometimes justified in a small group where the characteristic differences are well marked. There can be no question of the distinctness of this species from the other two in the genus. Besides the very large fruits of the new species, it may also be recognized by the coriaceous, puberulent, strongly venose leaflets which are distinctly different in shape from those of the other species.

Eperua venosa Cowan, sp. nov. Figure 17.

Arbor (?), ramulis foliisque glabris; stipulae deciduae, glabrae, triangulares, acutae, rigidae, ca. 5 mm longae; petiolus cylindricus, 33 mm longus, rachibus 40 mm longis, cylindricis; foliola bijugata, petiolulis 8–10 mm longis, transverse corrugulatis, laminis 20–22 cm longis, 8.5–9 cm latis, base obtusis (paribus apicalibus base obliquis), apice acuminatis, valde venosis, costa venis venulisque plus minusve salientibus, margine leviter recurvatis et nervo marginali pergracile praeditis; inflorescentia 14.5 dm longa, pedunculo 10 dm longo, leviter puberulo, ramulis distantibus, 3–4 cm longis, puberulis, pedicellis ca. 15 mm longis, puberulis; hypanthium cupulare, crassum, 7 mm longum, dense strigulosum, sepalis

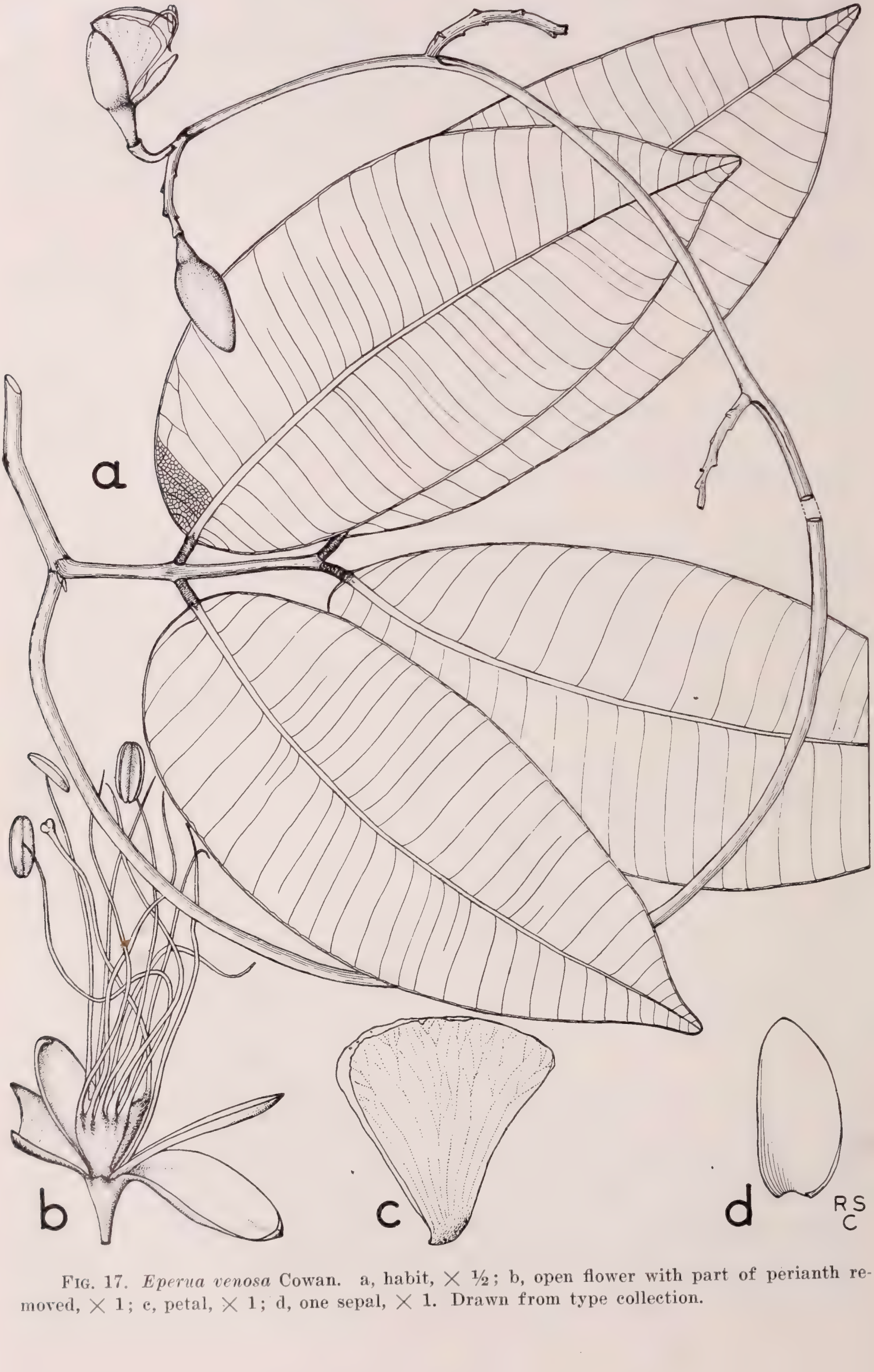


FIG. 17. *Eperua venosa* Cowan. a, habit, × ½; b, open flower with part of perianth removed, × 1; c, petal, × 1; d, one sepal, × 1. Drawn from type collection.

inaequalibus, coriaceis, 25–30 mm longis, 11–17 mm latis, oblongis, apice rotundatis (uno cucullato), externe strigulosis (saltem usque ad medium), intus glabris; petalum latoflabelliforme, 25–34 mm longum, 48–60 mm latum, externe ad basim strigulosum; stamina 10, unum liberum, filamentis alteris tubo 10 mm longo cohaerentibus, filamentis ca. 50 mm longis, basaliter strigosis, antheris 8.5–9 mm longis, oblongis, glabris; stigma bilobatum, capitellatum; stylus ca. 45 mm longus, glaber; ovarium oblanceolatum, 10 mm longum, 4.5 mm latum, luteo-sericeum; fructus ignotus.

Type Collection: *H. R. Kunhardt 20* (unicate, holotype NY), Angel Falls, Edo. Bolívar, Venezuela.

Unfortunately only a single sheet of this interesting species was collected, but additional collections may be anticipated, since the type locality is visited occasionally for its scenic beauty.

The coriaceous, strongly venose leaflets are distinguishing characteristics of the new species. It is related to *E. falcata* and to *E. rubiginosa*, perhaps most closely to the former, from which it differs in having larger but fewer, more coriaceous and venose leaflets, larger flower parts, and different pubescence on many of the parts.

Martiodendron elatum (Ducke) Gleason.

Ugueto, Alto Orinoco, Terr. Amazonas, Venezuela, Oct 10, 1951, *L. Croizat 820.*

A very large tree in the forest. As far as can be determined, this is the first report of this very interesting genus in Venezuela; although other species do occur in the Guianas and northern Brazil, the genus is better represented in the regions south of the Amazon River.

Schizolobium amazonicum Huber ex Ducke.

VENEZUELA: Bolívar: nearly leafless trees 7–15 m with viscid inflorescence and yellow flowers, locally frequent on Piedra Mapollos 10 km above El Carmen on Río Parguaza, elev. 250 m, *Wurdack & Monachino 41080;* eastern outlier of Cerro Marimarota (Cerro La Puerta), elev. 250 m, *Wurdack & Monachino 41378.*

This is the first record of this genus in Venezuela, although it has been collected previously in Amazonian Colombia by Schultes. It is not uncommon in southern Brazil but it becomes increasingly unfamiliar to the north, excepting occasional cultivated individuals. The collectors of this material have indicated that the plant is frequent along the tributaries of the middle Orinoco River as a natural component of the *laja* flora.

Sclerolobium aureum (Tul.) Benth.

VENEZUELA: Amazonas: occasional tree 5–8 m with yellow flowers and immature green fruits, edge of gallery forest, 1 km east of Hotel Amazonas, Puerto Ayacucho, elev. 100 m, *Maguire, Wurdack, & Bunting 36183;* Bolívar: savanna edge near Pilon 5 km N. E. of mouth of Río Parguaza, *Wurdack & Monachino 41136.*

This southeastern Brazilian species is best known in the States of Matto Grosso and Minas Gerais and hardly known north of those areas. Only one previous collection has been made in Venezuela; Dr. Lasser collected the plant in the State of Apure where he noted it as "very common" along the rivers. These recent collections match authentic material of the species very well, although the flowers in our collections are slightly larger.

LEGUMINOSAE—LOTOIDEAE [26]

Dioclea albiflora Cowan, sp. nov.

Frutex scandens, ramulis cano-velutinis; stipulae 2.5 mm longae, triangulares, sparse pilosulae, persistentes; folia pinnata, trifoliolata, petiolo 2.5–3.5 cm longo, cano-velutino, stipellis setaceis, ca. 2 mm longis, pilosulis, petiolulis 3 mm longis, cano-velutinis; foliolorum laminae 4.5–8.5 cm longae, 3.5–6 cm latae, utrinque cano-velutinae, base truncato-obtusae, apice obtusae et saepe rotundatae, foliolorum terminalium eae ellipticae vel late obovatae, foliolorum lateralium eae oblique ellipticae, supra costa venisque primariis planis, infra salientibus; inflorescentiae 30–68 cm longae, axe cano-striguloso, pedunculo ca. 12 cm usque ad 20 cm longo, pedicellis 5–8 mm longis, cano-strigulosis; bracteolae 2–2.5 mm longae, 1.5–2 mm latae, ovales, externe sparsissime strigulosae, floribus 30–35 mm longis; calyx sparse strigulosus, tubo 5–5.5 mm longo, intus sericeo, lobis 7.5–10.5 mm longis, lanceolatis, acutis; petala ciliolata, plerumque alba aliquando pallido-purpurea; vexillum ovale, apice bifidum, lamina 20–25 mm longa, 17–20 mm lata, stipite 3–4 mm longo; alarum laminae 25–27 mm longae, 10 mm latae, obtusae, ellipticae, stipite 4–4.5 mm longo, auriculo ca. 1.5 mm longo; carinae laminae ca. 20 mm longae, 8 mm latae, oblanceolatae, ad apicem cohaerentes; stamina omnia fertilia, filamentis tubo ca. 20 mm longo; stylus glaber, 5.5 mm longus; ovarium lineare, ca. 20 mm longum, 1 mm latum, sericeum; fructus anguste oblongus, in sutura adaxiali anguste alatus, 8.5–10.5 cm longus, 1.5 cm latus, fuscus, leviter sericeus, 8–10-spermus, seminis pallido-fulvo- et atro-fulvo-maculatis.

Type Collection: *J. J. Wurdack and J. V. Monachino 39980* (holotype NY), "woody vine sprawling over low shrubs, locally frequent. Calyx pale purple; corolla white with standard purple and yellow at base. Elev. 100–200 m (Seen also on Cerro Negro Peron and Piedra Mapollos.) (Fruits collected at Pto. Ayacucho on Jan 31, 1956). Piedra Marimare, east bank of Río Orinoco opposite head of Isla el Gallo, Estado Bolívar, Venezuela, Dec 19, 1955."

Paratypes: VENEZUELA: on crystalline laja 1–1.5 km east of Hotel Amazonas, Pto. Ayacucho, 100–120 m elev., Nov 7, 1953, *Maguire, Wurdack, & Bunting 36034;* same locality and collectors, Feb 18, 1954, *37711*.

Although the genus *Dioclea* badly needs revisionary study to determine the morphologic limits of many of the species, *D. albiflora* appears to be quite distinct from those species with small bracteoles and with all the stamens fertile. It is perhaps most nearly related to *D. guianensis* Benth., from which it differs in leaflet shape, size of flower, length of pedicels, size of the fruit, and color of the flowers. The flowers of the new species are usually pure white but some are reported by the collectors as very pale violet. From *D. apurensis* H. B. K. (emend Amsh.), another near relative, *D. albiflora* differs in leaflet size and shape, length of pedicels, pubescence on leaflets and perianth, and in flower color.

Dioclea rigida Cowan, sp. nov.

Frutex scandens, ramulis rufo-pilosis; stipulae 3.5 mm longae, triangulari-ovatae, externe pilosae; folia trifoliolata, pinnata, petiolo 3–4 (–8) cm longo, supra valde canaliculato, rufo-piloso, rachibus 1–2 cm longis, canaliculatis et pilosis, petiolulis 4–5 mm longis, leviter pilosis; foliolorum laminae lanceolato-ovatae usque ad lato-ovatae, rigido-coriaceae, valde venosae, 9–14 cm longae, 4–8 cm latae, basi valde cordatae, apice acutae, supra leviter pilosae sed glabrescentes, infra venis leviter pilosis, costa venisque leviter salientibus supra, infra valde salientibus, venulis leviter impressis supra, infra leviter salientibus; inflorescentiae 32–55 cm longae, axe puberulo, pedunculo 12.5–25 cm longo, pedicellis ca. 5 mm longis, strigulosis; bracteolae persistentes, ovatae, ca. 2 mm longae, 1.5 mm latae; calyx externe strigulosus, tubo ca. 4 mm longo, lobis usque ad 7 mm longis, acutis; fructus immaturus elliptico-oblongus, rufo-tomentosus, 9.5 cm longus, 2.5 cm latus, marginibus leviter dilatatus.

---

[26] By Richard S. Cowan.

Type Collection: *R. S. Cowan & J. J. Wurdack 31252* (holotype NY), "woody vine to 1 m high. Fruit green. Lf. veins & veinlets impressed above. Lflts. subconduplicate. Occasional along West Rim of cumbre, Cerro Paru, Terr. Amazonas, Venezuela, Feb 4, 1951."

This is an exceedingly distinct species with little relationship to any species other than an undescribed Colombian one and even there the similarity is only a superficial resemblance involving characteristics of the leaflets. The rigidly coriaceous, venose, cordate leaflets are distinctive.

Diplotropis strigulosa Cowan, sp. nov.

Arbor 20 m alta, 30 cm diametro, ramulis strigulosis; stipulae triangulares, 2.5 mm longae, 1 mm latae, externe dense strigulosae, intus glabrae; folia 8–11-foliolata, petiolo 2–4 cm longo, strigoso, rachibus 9.5–18.5 cm longis, strigosis; foliola alterna vel saepe opposita, petiolulo 4–6 mm longo, strigoso, laminis coriaceis, ellipticis vel lanceolato-ellipticis, apice acutis, extremitate obtuso, base inaequilateraliter acutis, 7–11.5 cm longis, 3–4 cm latis, supra glabris, infra (costa strigosa excepta) strigulosis; venae primariae secundariaeque prominulae, costa leviter impressa supra, infra salienti; inflorescentiae paniculatae, ca. 15–25 cm longae, axe subappresso-tomentoso, bracteis bracteolisque parvae, tomentosis, 1.5–2.5 mm longis, pedicello 4–5 mm longo, subappresso-tomentoso; calyx incurvus, 10 mm longus, externe strigosus et strigulosus, intus puberulus, lobis 3–3.5 mm longis; vexillum glabrum, 11–12.5 mm longum (stipite 3–4.5 mm longo), trilobatum, lobo supero oblongo, 5 mm longo, 4 mm lato, obtuso, lobis lateralibus auriculatis, 2–3.5 mm longis; alae laminae glabrae, oblongae, 8.5 mm longae, 5 mm latae, stipite ca. 4.5 mm longo; petalorum carinae laminae glabrae, ca. 7 mm longae, 4 mm latae, oblongae, stipite 4.5 mm longo; stamina 10, libera, filamentis 6–7 mm longis, inaequalibus, glabris; pistillum subsessile; stylus 5 mm longus, glaber; ovarium tomentosum; fructus ignotus.

Type Collection: *R. S. Cowan & J. J. Wurdack 31362* (holotype NY), "tree 20 m × 30 cm diam. Lflts. dark green above, subcoriaceous; calyx red-brown; petals rose, wrinkled. Occasional in valley head above camp, Cerro Paru, 2000 m elev., Terr. Amazonas, Venezuela, Feb 10, 1951." Paratype: *31392*, same data and collectors.

Diplotropis is represented in Venezuela by very few species, none of which are very closely related to *D. strigulosa*. The latter is somewhat similar to the southern Brazilian *D. ferruginea Benth.* which has the leaflets villose or tomentose beneath, and much smaller flowers.

Dipteryx.

There are some annoying nomenclatural muddles and some very interesting morphological features in this genus, which the writer proposes to study sub-

sequently in the course of a complete review of the group. At this time, however, several notes are necessary to validate combinations used in the identifications of numerous recent collections. Most of these nomenclatural changes have become necessary through the conservation of the generic name *Dipteryx* (sensu lato) over *Coumarouna* Aubl., *Taralea* Aubl., and two less-known names. Ducke, Macbride, and others have held that *Taralea* can be distinguished from *Dipteryx* (*Coumarouna*) but the only difference is in the fruits. A drupaceous, indehiscent fruit characterizes *Dipteryx* while *Taralea* has laterally compressed, dry, woody pods. However, in other respects, especially in the flowers, there are no consistent, important differences. If the fruiting characters are sufficiently important to override other considerations in delimiting genera in this complex, then we must be prepared to accept the equally unnatural, multitudinous segregates (often based primarily on fruiting characters) in such genera as *Astragalus*, *Cassia*, *Acacia*, and *Mimosa*. It might be just as useful and certainly more consistent with phylogeny to consider such segregates as subgenera or sections, as Bentham and others have done in many of these complex genera.

Dipteryx cordata (Ducke) Cowan, comb. nov.

Taralea cordata Ducke, Arch. Jard. Bot. Rio Jan. 4: 71. 1925.

Several collections from Amazonian Colombia, Venezuela, and Brazil are now known of this heretofore poorly collected species; the best series by far is that made by R. E. Schultes and his associates in Colombia.

Dipteryx rigida (Schery) Cowan, comb. nov.

Taralea rigida Schery, Fieldiana Bot. 28: 266. 1952.

VENEZUELA: Amazonas: infrequent shrub in margin of Savanna No. 3, base of Cerro Yapacana, 150 m elev., *Maguire, Cowan, & Wurdack 30484;* same data and collectors, Jan 7, 1951, *30810.*

These two collections are, unfortunately, unicates; they have been compared with the type of this species and, although there are a few minor differences, they do not appear to be significantly different. There is a great altitudinal disjunction between the original material from Kavanayén in the Gran Sabana and these collections on the opposite side of Venezuela, but in other respects the ecological conditions are much the same.

Dipteryx reticulata Benth.

Taralea steyermarkii Schery, Fieldiana Bot. 28: 268. 1952.

A rather substantial number of recent collections have been identified as this species and it is unfortunate that one of these should have been described as new. Representative collections of the species are: *Maguire & Wurdack 33773, Schomburgk 951, Jenman 73.*

Machaerium altiscandens Ducke.

VENEZUELA: Bolívar: woody vine climbing 15 m on trees, fls. white; faintly lavender-flushed. Occasional along Río Parguaza just below Raudal Maraca (110 river km above mouth) elev. 115 m, *Wurdack & Monachino 40991.*

This collection represents the first record of this species in Venezuela. It was originally described from the vicinity of Rio Pará (Belém) and Rio Tapajós but Amshoff records in the *Flora of Suriname* its presence in French Guiana and the State of Pará, Brazil.

Pterocarpus amazonum (Mart. ex Benth.) Amshoff.

VENEZUELA: Amazonas: "Arbol 7 m. Flores amarillas." Río Orinoco between mouth of Río Atabapo and Caño Masagua 10 km upstream, elev. 150 m, May 16, 1954, *J. S. Level 94.*

This is the first record of this distinctive species in Venezuela; it was known previously from Amazonian Brazil, Colombia, Peru, and Ecuador. The species is characterized by swollen inflorescence-axes which serve as formicaria; it was formerly better-known as *P. ulei* Harms, but this is clearly a later name for the Bentham species, as Amshoff has shown.

Stylosanthes angustifolia Vogel.

VENEZUELA: Bolívar: flowers yellow. Locally frequent at base of Cerro San Borja, Río Orinoco, elev. 100 m, *Wurdack & Monachino 39850.*

This is a very infrequent species in Venezuela and until very recently it was unknown in the country. It is quite distinct by virtue of its narrowly cylindric inflorescences and uniflorous bracts. It has been recorded previously from Brazil and the Guianas.

RUTACEAE[27]

Decagonocarpus oppositifolius Spruce ex Engler.

VENEZUELA: Amazonas: frequent on granitic summit of Piedra Nunca (just north of Piedra Cucuy), elev. 200–250 m, Río Negro, Apr 1953, *Maguire & Wurdack 34952;* frequent on open lower and middle slopes of Piedra Arauicaua, elev. 120–170 m, ríos Pacimoni-Yatua, Feb 1954, *Maguire, Wurdack & Bunting 37475;* frequent in open areas on Piedra Tururumeri, ríos Pacimoni-Yatua, Casiquiare, elev. 110–220 m, Feb 1954, *Maguire, Wurdack & Bunting 37493.*

Until Maguire et al. made several collections of this species, this monotypic genus was known in Venezuela only by the type collection. In the first installment of the "Botany of the Guyana Highland" these collections were reported and observations concerning the morphology and ecology of the species were recorded there.

The collections cited above, from the type region, add little to our knowledge of the species morphologically. It is interesting to note that in all three collections, the corollas and the under sides of the leaves are sparsely to distinctly pubescent, as described originally, while the collections from farther north are glabrous; there do not appear to be any other differences.

Decagonocarpus cornutus Cowan, sp. nov. Figure 18.

Arbuscula 1–2 m alta, ramulis glabris vel puberulis, nitidis; petioli glabri, teretes, (3–) 4–8 (–10) mm longi; foliorum laminae glanduloso-punctatae, crassae, carnosae, ellipticae vel oblanceolato-ellipticae, glabrae, apice obtusae usque ad rotundatae, basi cuneato-acutae, margine anguste valde revolutae, (25–) 30–60 (–70) mm longae, (12–) 15–30 mm latae, supra eveniae, infra costa prominenti, venis subobscuris; inflorescentiae unilateraliter racemosae, axe leviter puberulo, pedunculo 9–16 mm longo, rhache ca. 7–58 mm longa, pedicellis 4–5 mm longis; calyx brevi-cupulatus, 2.5–4 (–5) mm longus, glaber (vel in var. sparse puberulus et ciliolatus), lobis 1–1.5 mm longis, triangularibus (vel suborbicularibus in var.); corolla carnosa, aurantiaco-rubra, tubo 23–28 mm longo, externe glabro (vel in var. plerumque puberulo), intus villoso, apicem versus gradatim

---

[27] By Richard S. Cowan.

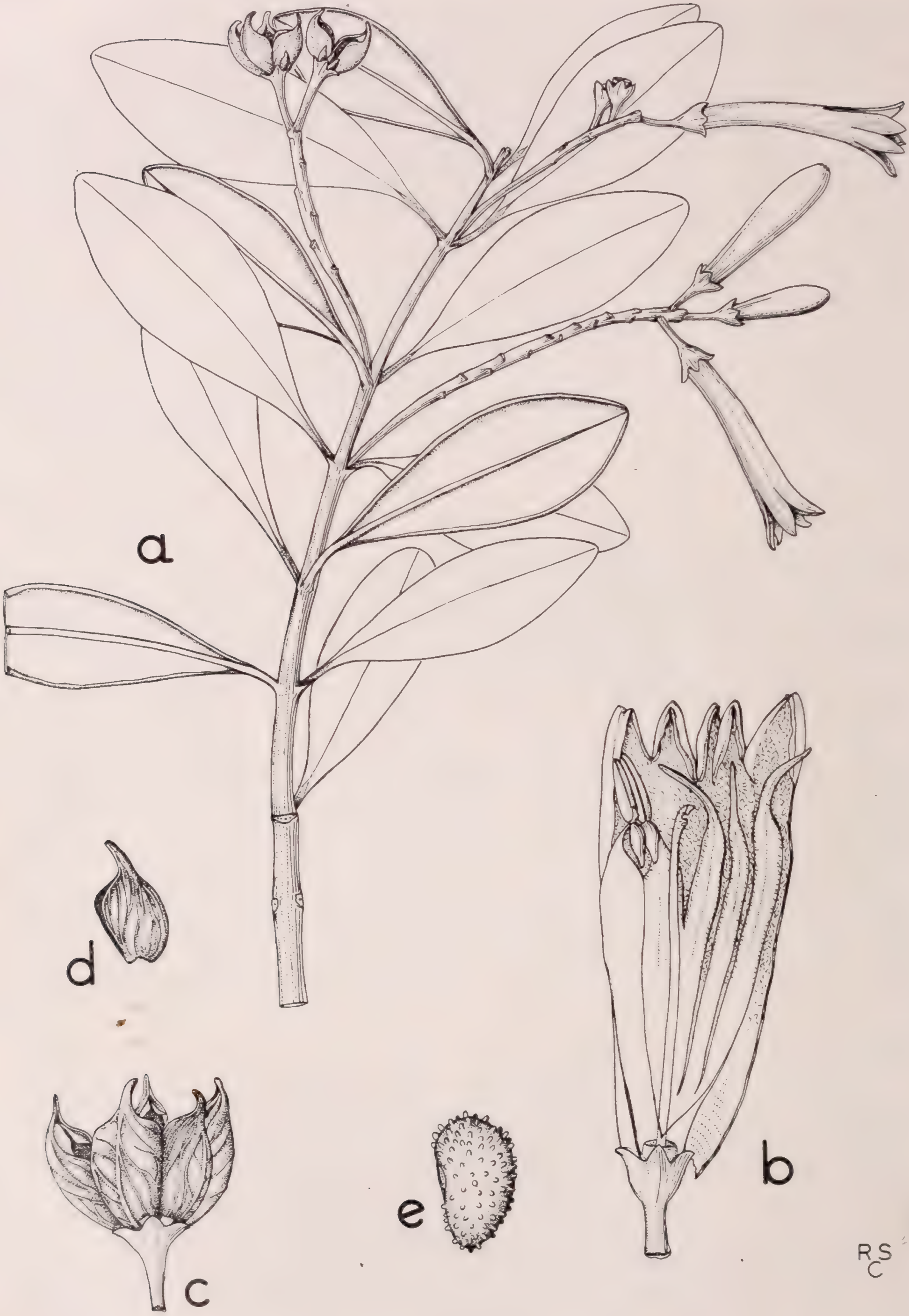


FIG. 18. Decagonocarpus cornutus Cowan. variety cornutus. a, habit, × 1; b, dissected flower, × 2; c, mature fruit, × 2; d, one mature mericarp, × 2; e, seed, × 5. Drawn from type collection.

latiore, lobis (5.5–) 7–8 mm longis, lanceolatis, acutis, patentibus, ciliolatis; stamina fertilia 2, antheris oblongis, 4.5–5 mm longis, basi appendice flabellata 2 mm longa praeditis, staminodiorum parte libera 5–6 mm longa, filamentis in tubo cohaerentibus cum corolla adnato, filamentorum parte libera ca. 3.5 mm longa, triangulari; stigma obliquum, puberulum; stylus 23 mm longus, apice sparse puberulus; ovarium 5-lobatum, glabrum, disco carnoso, 2 mm longo, glabro; fructus glaber, 5-partitus, cornutus, cornubus curvatis, 2–4 mm longis, dorso unirugosus, corpore 5–7 mm longo, transverse valde curvato-sulcato; semen oblongum, nigrum, echinatum, 4 mm longum.

Decagonocarpus cornutus var. **cornutus.**

A var. *congesto* foliis non spissis, majoribus (30–60 mm longis, 15–30 mm latis), petiolis longioribus (4–8 mm), calyce glabro lobis triangularibus, corollarum tubo longiore (ca. 27–28 mm) glabro differt.

Type Collection: *B. Maguire & C. K. Maguire 35118* (holotype NY), "shrub 1-2 m high; lvs. succulent. Fls. orange-red; fruit deeply 5-lobed. Frequent in right branch of Caño Yutaje, elev. 1300 m, Cerro Yutaje, Río Manapiare, Terr. Amazonas, Venezuela, Feb 9, 1953."

Paratypes: VENEZUELA: Amazonas: Cerro Yutaje, 1250–1300 m elev., Feb 1953, *Maguire & Maguire 35086, 35108, 35195*; Cerro Coro-Coro, 1500 m elev., *Maguire & Maguire 35460*.

Decagonocarpus cornutus var. **congestus** Cowan, var. nov.

A var. *cornuto* foliis ramulorum ad apicem congestis, minoribus (ca. 25 × 12 mm), petiolis brevioribus (ca. 3 mm), calyce leviter puberulo lobis ciliolatis, corollarum tubo breviore (ca. 23 mm longo) plerumque plus minusve puberulo differt.

Type Collection: *Maguire 31693* (holotype NY), "shrub to 1 m. lvs. succulent, fls. orange-red. Occasional on summit of Cerro Guanay, 1800 m, Terr. Amazonas, Venezuela, Feb 2, 1951." Paratype: same data and collector, *31713*.

This species differs from *D. oppositifolius*, the only previously known species in the genus, in size and shape of the leaves and of the calyx and in the posture of the corolla-lobes. It differs also in having strikingly horned fruits which have only a single ridge on the back, rather than two as in *D. oppositifolius* (fruits of var. *congestus* have not been seen but they are very likely similar to those of the typical variety). The specific epithet is intended to call attention to the horned fruits.

Var. *congestus* has the leaves somewhat smaller and congested at the branchlet tips; these plants also have shorter petioles, a pubescent calyx, and usually a puberulous corolla.

Galipea stelligera Cowan.

VENEZUELA: Amazonas: Cerro Yutaje, Jan–March 1953, 1300–2000 m elev., *Maguire & Maguire 35262, 35277, 35302, and 35440.*

These are the first collections subsequent to the description of this species from Cerro Duida, more than 100 miles to the south. This extension of range suggests that the species may be expected on other of the sandstone mountains in western Venezuela.

Ravenia ruellioides Oliver, Timehri **5:** 191. 1886.

R. tatei Gleason, Bull. Torrey Club **58:** 376. 1931.

R. ruellioides var. *ptariana* Steyerm. Fieldiana Bot. **28:** 273. 1952.

VENEZUELA: Bolívar: Cerro Guaiquinima, Río Paragua, *B. Maguire 32941, 32964, 33088, 33089.*

In addition to these collections, several others have been made in the Gran Sabana area and five were reported from Cerro Sipapo in Part I of "Botany of the Guyana Highland." At the time of that publication, the species appeared to be rather uniform, but this large number of subsequent collections has revealed significant variation in both vegetative and fertile parts. With the large series of collections now available for study, it is at once obvious that Steyermark's variety is completely untenable; the characters he uses (op. cit. 273) to separate the taxa of Guayana from each other are perhaps the most variable ones: the lengths of the flowering peduncle and of the corollas vary widely and the pubescence on the lower surfaces of the leaves is just as unreliable for taxonomic purposes.

Gleason separated his species (*R. tatei*) on the relatively broader, shorter petioled leaves which are more or less obtuse basally, smaller flowers with glandular sepals, etc. Parts of some of the collections cited above could possibly be referred to this species but none could be wholly. More detailed studies in the genus may indicate the desirability of recognizing this group at some level, but I cannot; it is seemingly only a variant of the variable *R. ruellioides.*

Vol. 10, No. 1 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN July 1, 1958

ANATOMY OF GUAYANA MUTISIEAE. PART II.

SHERWIN CARLQUIST

In a preceding paper (Carlquist 1957a), the variation in pollen morphology and floral venation of certain genera of Mutisieae from the Guayana Highland of Venezuela was surveyed. These genera were also incorporated in a study of wood anatomy in this tribe (Carlquist 1957b). In the present study, differences among these taxa in stem anatomy (other than secondary xylem), node, leaf, and involucre anatomy are described and related to previous data in order to demonstrate the nature of differentiation among these genera, which appear to form a phylogenetic unit (Maguire 1956). In addition, the anatomy of the Guayana Mutisieae is significant in relation to the problem of primitiveness in the Compositae, since it appears that *Stenopadus*, *Gongylolepis*, and their allies contain a constellation of characters best interpreted as primitive in the family as a whole.

ACKNOWLEDGMENTS

Sincerest appreciation is expressed to Dr Bassett Maguire, who furnished the materials for this investigation from collections of The New York Botanical Garden which were chiefly made by him and his associates on expeditions to Venezuela (Maguire et al. 1953). Certain specimens from other herbaria proved helpful for this study, and thanks are due to curators of the Gray Herbarium, Harvard University, and the Herbarium of the University of California, Berkeley. These specimens are cited as (GH) and (UC) respectively.

MATERIALS AND METHODS

Liquid-preserved materials were available for several taxa (*Chimantaea rupicola, Steyermark & Wurdack 748; Gongylolepis huachamacari* subsp. *neblinensis, Maguire 37353; Neblinaea promontorium, Maguire, Wurdack & Bunting 37016).* These collections proved invaluable in showing the nature of cellular contents for vegetative structures. In all other taxa, herbarium material was used exclusively. Good results were obtainable with the following techniques. Stems, leaves, and involucres were cleared in a warm 2.5 per cent NaOH solution until most contents had been removed; subsequent treatment with an aqueous 25 per cent chloral hydrate solution proved helpful in further clearing and restoring natural shape and proportions to cells. For both liquid-preserved and "revived" herbarium materials, treatment with commercial-strength hydrofluoric acid was found desirable in most instances on account of the excessive sclerification of many structures. Treatment varied from a few days to several weeks, depending on the structure. After thorough washing, materials were embedded in paraffin according to the tertiary butyl alcohol series of Johansen (1940). A double-embedding technique using celloidin followed by the typical paraffin method (Johansen) was necessary for some of the tougher structures. Sections were stained with Northen's modification of Foster's tannic acid—ferric chloride method (Johansen) and mounted in Canada balsam.

Magnification of the figures is indicated by brackets, which represent 100 μ unless otherwise labeled. Where only one bracket appears on a plate, all the figures of that plate are at the same magnification. Various conventions requiring explanation have been used in the drawings. In figures showing cellular detail, cell walls of varied thickness are represented as follows: thin-walled, a single line separating cells; moderately thick-walled, a pair of lines separating cells; thick-walled sclerenchyma or tracheary elements, a pair of concentric lines representing the thickness of the wall for each cell. Obviously, some degree of integration between these three types occurs, so the representations are not precise, although they are approximately correct.

In diagrammatic drawings, patterns have been used to differentiate cell types and tissues. These are as follows: stippled, sclerenchyma; white, parenchyma (and epidermis, if unsclerified); black, xylem; cross-hatched, phloem; horizontal lines, thin-walled sclerenchyma or thick-walled parenchyma (walls showing lignification); wide vertical lines, cork; narrow vertical lines, laticiferous cells.

In the anatomical descriptions which follow, the genera of Gochnatinae *(Stenopadus, Stomatochaeta, Chimantaea,* and *Quelchia)* are considered first. These are followed by genera belonging to Gerberinae (Mutisinae of Hoffmann, 1890), *Gongylolepis* and its allies *(Achnopogon, Neblinaea,* and *Duidaea).* The rather isolated monotypic genus *Glossarion* is considered last in each case.

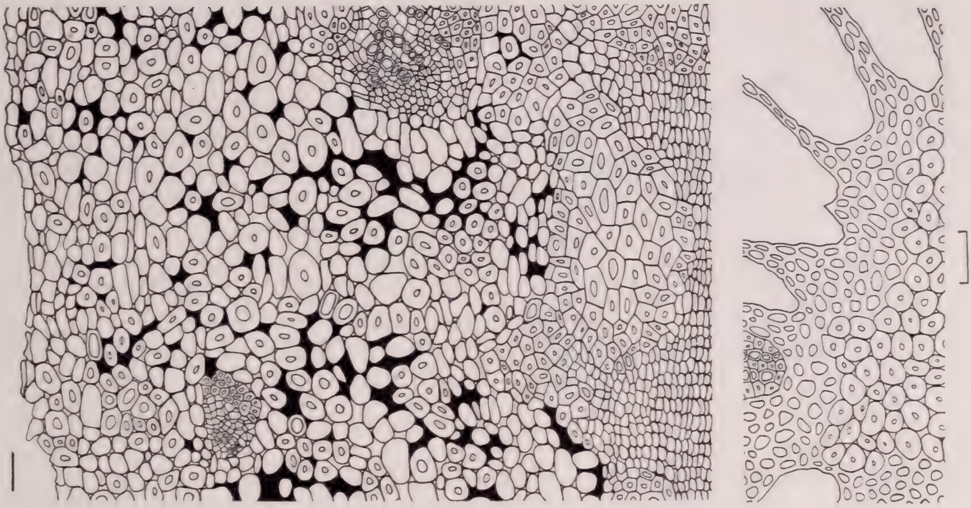
I. STEM

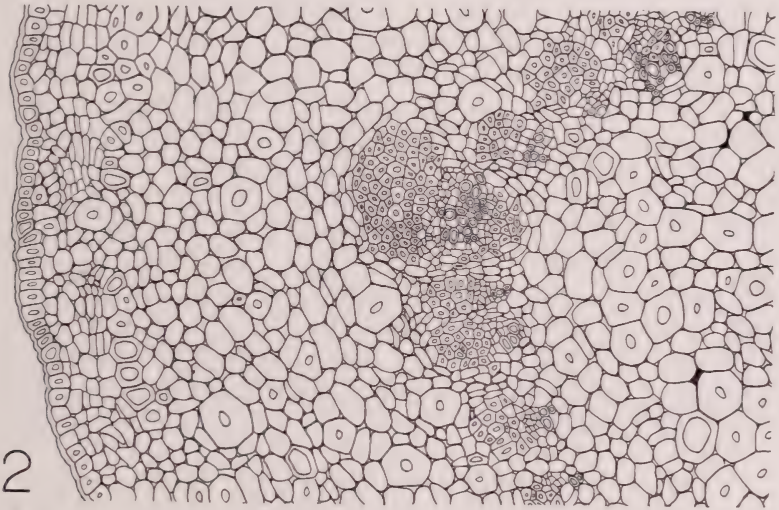
Cortex and Pith. Within Gochnatinae, *Stenopadus, Stomatochaeta,* and *Chimantaea* show a similar basic pattern. *Stenopadus* (fig. 1) has a cortex containing numerous thick-walled sclereids, developed individually or in irregular groups. Cortical leaf traces show a prominent cap of fibers which, on larger traces, extend around the bundle (top of fig. 1). Fibrous bundles are also formed on strands of the vascular cylinder. During secondary growth, these are augmented by sclerification of parenchyma cells in interfascicular areas, so that a nearly continuous cylinder of sclerenchyma is present around the phloem of such a stem. In the pith (fig. 1, right), nests of thick-walled sclereids are embedded in a background of thin-walled sclerenchyma. Occasional areas of thin-walled parenchyma may also be present in pith of species of *Stenopadus.* In the details mentioned above, other species of *Stenopadus* examined *(S. stipitatus, S. cucullatus)* were found to be identical.

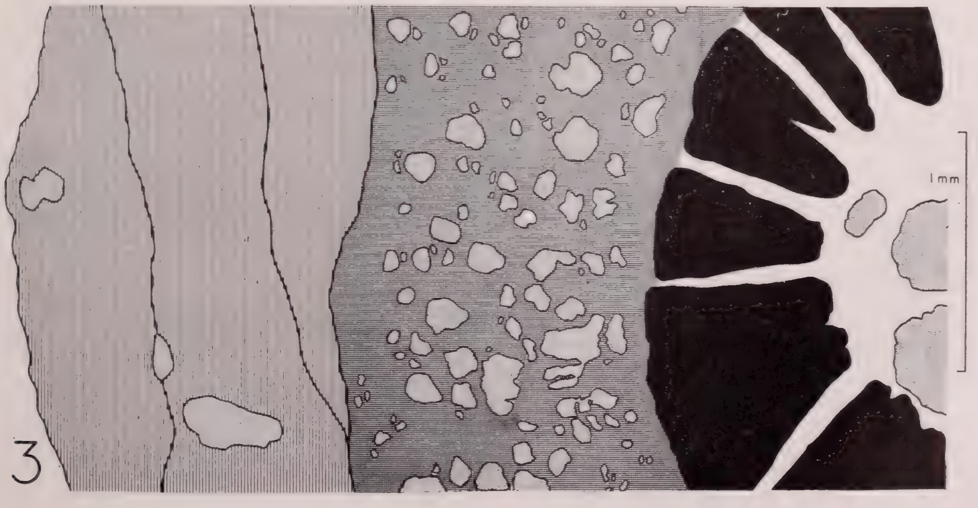
The relatively narrower stems of *Stomatochaeta* (fig. 2) conform to much the same pattern. The primary stem shown is characterized by a sclerified epidermis covered with a prominent cuticle. In the cortex, thick-walled sclereids are present. Fibrous bundle caps occur, and during secondary growth a few interfascicular parenchyma cells sclerose, although not enough to form the conspicuous cylinder seen in *Stenopadus* stems. In the pith, nests of sclereids are surrounded by thin-walled parenchyma. During secondary growth, this parenchyma becomes lignified, so that mature pith is indistinguishable from that of *Stenopadus.*

Chimantaea (fig. 3) shows many of the same features, seemingly modified in accordance with the very different growth habit of this genus. *Chimantaea*

FIG. 1. *Stenopadus connellii, Wurdack 34265;* portion of transection of stem with secondary growth; periderm at left; xylem and pith at right; black areas among cells represent carbonized resin deposits. FIG. 2. *Stomatochaeta condensata, Maguire 40603;* portion of transection of primary stem, epidermis at left. FIG. 3. *Chimantaea rupicola, Styermark & Wurdack 748;* diagram of transection of stem with secondary growth, periderm at left; symbols explained in text.


1


2


3

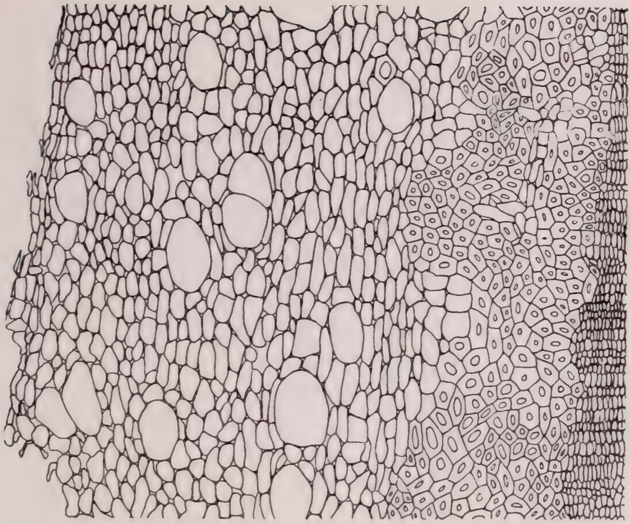
has a "megaphytic" habit of growth; that is, a single thick unbranched stem bearing a rosette of leaves is formed. In the stem with secondary growth shown in figure 3, the high degree of cork development is shown, successive periderms being indicated. This condition is in contrast to the relatively modest development of secondary xylem. Sclereid nests are relatively infrequent in the cortex, and become included in the cork during periderm formation. Bundle caps occur, although intervening parenchyma never becomes sclerified to connect them as it does in *Stenopadus.* In the secondary phloem files or patches of fibers are formed. The pith, which consists of thin-walled parenchyma at maturity, contains occasional nests of sclereids, although such nests are fewer than in the pith of *Stenopadus* or *Stomatochaeta.* Despite differences in size among species (e.g. large in *C. mirabilis*, very small in *C. rupicola*) no essential differences in anatomy could be detected.

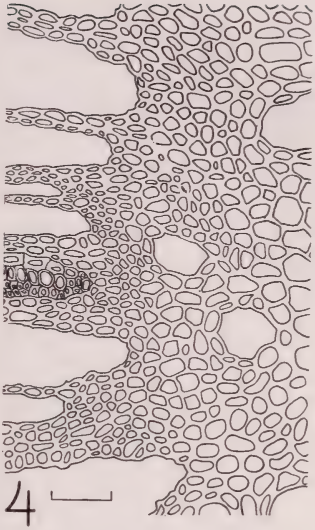
The differences among the three above genera seem related to habit features. The prominence of sclerenchyma in *Stenopadus* may be correlated with its arboreal habit. The presence of a sclerified epidermis on *Stomatochaeta* stems is a diagnostic feature, while the limited sclerenchyma in pith and cortex, together with prominent cork formation, are characteristics which occur only in *Chimantaea.* Cortical sclereids have been reported for *Stifftia* (Vuillemin 1884), a genus which appears on other grounds to be closely related to *Stenopadus.* Elsewhere in Compositae, the only report of cortical sclereids appears to be that of Quentin (1911) in *Baccharis.* It is worthy of note that nests of sclereids in pith and cortex of stems and peduncles are very prominent in a Hawaiian member of Gochnatinae, *Hesperomannia* (Carlquist 1957c).

The genus *Quelchia* (fig. 5), although a member of Gochnatinae on account of its actinomorphic corollas, is described here in connection with Gerberinae because of its stem structure. In *Quelchia*, as well as in *Gongylolepis* (fig. 4), diffuse sclereids are absent in cortex and pith. In both of these genera, however, sclerification of parenchyma cells in areas between the conspicuous bundle caps occurs. Mature pith of *Gongylolepis* consists of lignified parenchyma cells, although a few thick-walled sclereids were seen in pith of *G. benthamiana.* Pith of *Quelchia* conforms to the pattern seen in *Gongylolepis.* In all species of *Gongylolepis* examined, a bundle cap is present on cortical leaf traces. A few such fibers may also be present on the xylem pole of these traces. In *Quelchia*, however, fibers occur only on the phloem pole of such bundles. *Achnopogon* and *Duidaea* are like *Quelchia* in this respect; they have relatively few interfascicular sclereids, however. In contrast, *Neblinaea* possesses the same prominent cylinder of sclerenchyma around the bundles as shown for *Gongylolepis* in figure 4. Moreover, occasional diffuse sclereids are present in the cortex of *Neblinaea*, and cortical leaf traces are encased in a complete cylinder of fibers, in much the same manner as those of *Glossarion* (fig. 7). Pith in *Achnopogon*, *Duidaea*, and *Quelchia* is like that in *Glossarion.* Notable in the stem structure of *Glossarion* is the

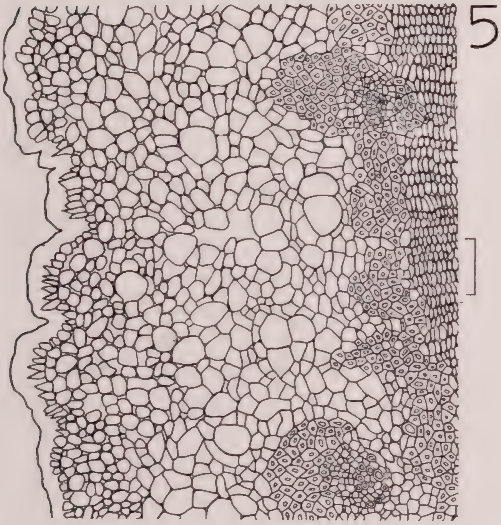
---

FIG. 4. *Gongylolepis benthamiana, Maguire 33225;* portion of transection of stem with secondary growth, cortex at left. FIG. 5. *Quelchia cardonae, Wurdack 565;* portion of cortex transection, epidermis at left. FIG. 6. *Gongylolepis huachamacari* subsp. *neblinensis, Maguire, Wurdack & Bunting 37353;* portion of tangential section of cortex, showing laticiferous cells (shaded). FIG. 7. *Glossarion rhodanthum, Maguire, Wurdack & Bunting 37190;* portion of transection of stem with little secondary growth; xylem and pith separated at right.

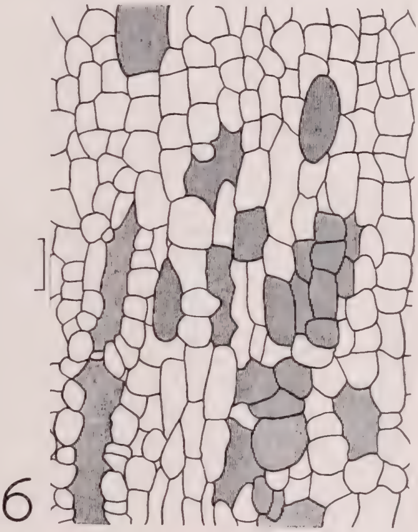




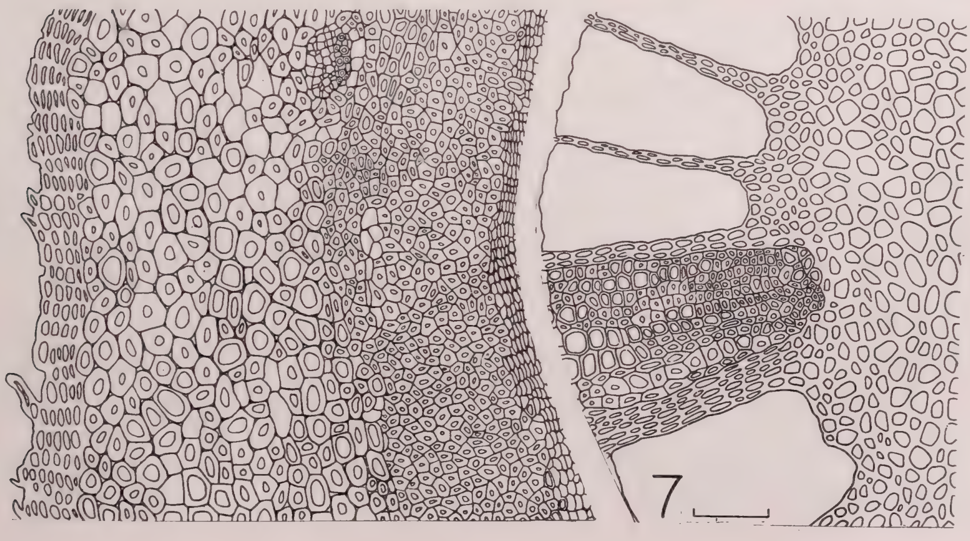
4



5



6



7

high degree of cortex sclerification, exceeding even that in *Stenopadus*. Because of this combination of features, it is difficult to ally *Glossarion* with either the gongylolepoid or stenopadoid type.

Differences among the various genera in respect to periderm origin and abundance are quite evident. Information from approximately comparable stems may be summarized as follows, periderm origin being noted where material permitted:

Stenopadus: moderate, origin in third or fourth hypodermal layer
Stomatochaeta: scanty, origin in third or fourth hypodermal layer
Chimantaea: abundant, successive periderms in young stems
Quelchia: moderate, origin in second or third hypodermal layer
Gongylolepis: moderate, origin in second hypodermal layer
Achnopogon: prominent, origin in first or second hypodermal layer
Duidaea: prominent, origin in first or second hypodermal layer
Neblinaea: scanty, origin in first hypodermal layer
Glossarion: prominent, origin in first hypodermal layer

Subepidermal origin of cork, such as occurs in these taxa, has been found in various Compositae by Douliot (1889), who did, however, record epidermal cork origin in the mutisioid *Barnadesia*.

In none of the stems studied was there any indication of endodermis formation, either in the form of Casparian strips, such as occur in Heliantheae (Carlquist 1957d), or unevenly sclerified cells, such as occur in *Barnadesia*.

Laticifers. The occurrence of laticifers in Compositae belonging to tribes other than Cichorieae was not generally realized until Col's (1904) demonstration of their occurrence in Cynareae, Vernonieae, and Arctotideae. It is of interest that two genera included by Hoffman (1890) in Mutisieae, *Berardia* and *Warionia*, were found to contain laticifers. Col concluded on the basis of laticifer occurrence and other characters that these two genera belonged in Cynareae, a treatment followed by subsequent authors, such as Cronquist (1955). The discovery that stems of liquid-preserved material of *Gongylolepis huachamacari* subsp. *neblinensis* and *Neblinaea promontorium* contain laticiferous cells was therefore of considerable interest to the writer. The nature of the laticiferous structures in these two species enabled intrepretation of similar structures in other genera.

Laticiferous cells in the cortex of *Gongylolepis huachamacari* subsp. *neblinensis* (fig. 6), are often somewhat larger and more rounded than neighboring cells. While some laticiferous cells, by virtue of their extent, might suggest an articulated series from which the intervening walls had been resorbed, no such walls were encountered, and the occurrence of groups of cells with intact walls suggests that at least predominantly we are concerned with individual cells, some of which enlarge and invade intercellular spaces. Other laticiferous cells, however, merely remain rounded. That the contents of these cells was indeed latex was confirmed by the milky appearance of cells *en masse*, as well as under higher magnification. Moreover, contents of these cells resisted safranin, a stain which is readily absorbed by resinous materials. That some laticiferous cells, particularly in outer portions of the cortex of *G. huachamacari* subsp. *neblinensis*, did contain resins was suggested by the presence of larger globules, which did stain deeply with safranin. Such cells proved to be present not only in cortex, but also in pith, leaves (fig. 21), and other parts of *Gongylolepis* and its allies, as well as *Quelchia*. Identification of laticiferous cells in herbarium material was based partly on their greater size, as compared to surrounding cells, and partly on the fact that the clearing techniques employed did not completely remove cell contents, which thus stained in whole mounts and sections of cleared parts. The taxa in which these were located with reasonable certainty are as follows:

Gongylolepis huachamacari subsp. *neblinensis:* cortex, pith, leaf
G. benthamiana: cortex, pith (fig. 4), involucral bracts
G. fruticosa: cortex, leaf
Duidaea pinifolia: cortex, leaf, achene
Neblinaea promontorium: cortex, pith, peduncle
Quelchia cardonae: cortex, leaf, achene

Although laticiferous cells may occur more widely in the plant body than is indicated for the above taxa, their presence in the genera listed is of considerable interest. With the exception of *Achnopogon,* in which their presence could not be definitely established, laticiferous cells are present in all the Guayana genera of the Gerberinae. The presence, in addition, of laticiferous cells in *Quelchia* is noteworthy in view of its systematic position, and it may be that *Quelchia* is closer to Gerberinae than *Stenopadus, Stomatochaeta, Chimantaea,* and *Glossarion,* which apparently do not possess laticiferous cells.

Beside the interest inherent in a new record of laticifers for the tribe Mutisieae, the fact that they are of the type found by Col in Arctotidae, Cynareae, and Vernonieae is of possible significance. Col, however, records anastamosing articulated laticifers in addition in *Gazania* of Arctotidae and in the subtribe Carlinae of Cynareae. The writer considers, however, that Col's designation (p. 169) of individual laticiferous cells as 'formes imparfaites . . . . témoinage d'une évolution extensive ou régressive'' is open to doubt. It may be that in such individual laticiferous cells, singly or in groups, we are witnessing a primitive, rather than a degenerate form of the well-developed laticifers characteristic of Cichorieae.

Secretory canals. The term ''secretory canal'' here refers to the structures sometimes designated as ''oil canals'' or ''resin canals'' by various authors. Where present, they are always an intercellular formation, thus differing from laticifers, which are cellular in nature. Within the genera of this study no true secretory canals—in the sense of their discrete structure in Heliantheae—can be said to occur. In parenchyma or sclerenchyma of cortex and pith in *Stenopadus* and *Stomatochaeta* (figs. 1, 2), however, resins are abundantly secreted into intercellular spaces; these resins carbonize, giving a blackish color to the cortex and pith of these genera. Although such resin secretion is present even in leaves, involucral bracts, and achenes of these genera, in no case could a definite secretory canal be said to be present. It is of interest that secretion of resins into vessels and libriform fibers of the secondary xylem is also characteristic of these and other Gochnatinae (Carlquist 1957b).

By contrast, none of the Gerberinae studied showed this type of resin secretion. It may be that secretion of resinous materials into the laticiferous cells replaces deposition in intercellular spaces in these genera.

True secretory canals occur in some, although they are absent in many genera of Mutisieae. Van Tieghem (1872) has reported them in the root of *Stifftia chrysantha, Gerbera schimperi,* and others. He notes their presence in stem and leaf of *Ainsliaea acerifolia, Hyalis spartiodes, Lycoseris mexicana, Mutisia retusa, Nassauvia digitata,* and *Polyachrus villosus.* Recently, Cabrera (1951) has demonstrated their presence in *Aphyllocladus denticulatus, A. ephedroides,* and *Plazia.* It is of interest, therefore, that secretory canals occur in all subtribes of Mutisieae. Because of this fact and the infrequency of such canals in the tribe (see Solereder, 1908, for a list of Mutisieae in which they do not occur), the phylogenetic interpretation is not clear. The presence of unorganized intercellular deposition of resinous products may represent a stage before development of organized canals, or it may represent a substitution for such canals following their loss phylogenetically.

Node and Petiole. The following numbers of leaf gaps were found for the genera of Guayana Mutisieae:

Stenopadus: 5	*Gongylolepis:* approximately 7
Stomatochaeta: 3	*Achnopogon:* 3
Chimantaea: 5	*Duidaea:* 3
Quelchia: 3	*Neblinaea:* 5

Glossarion: 5

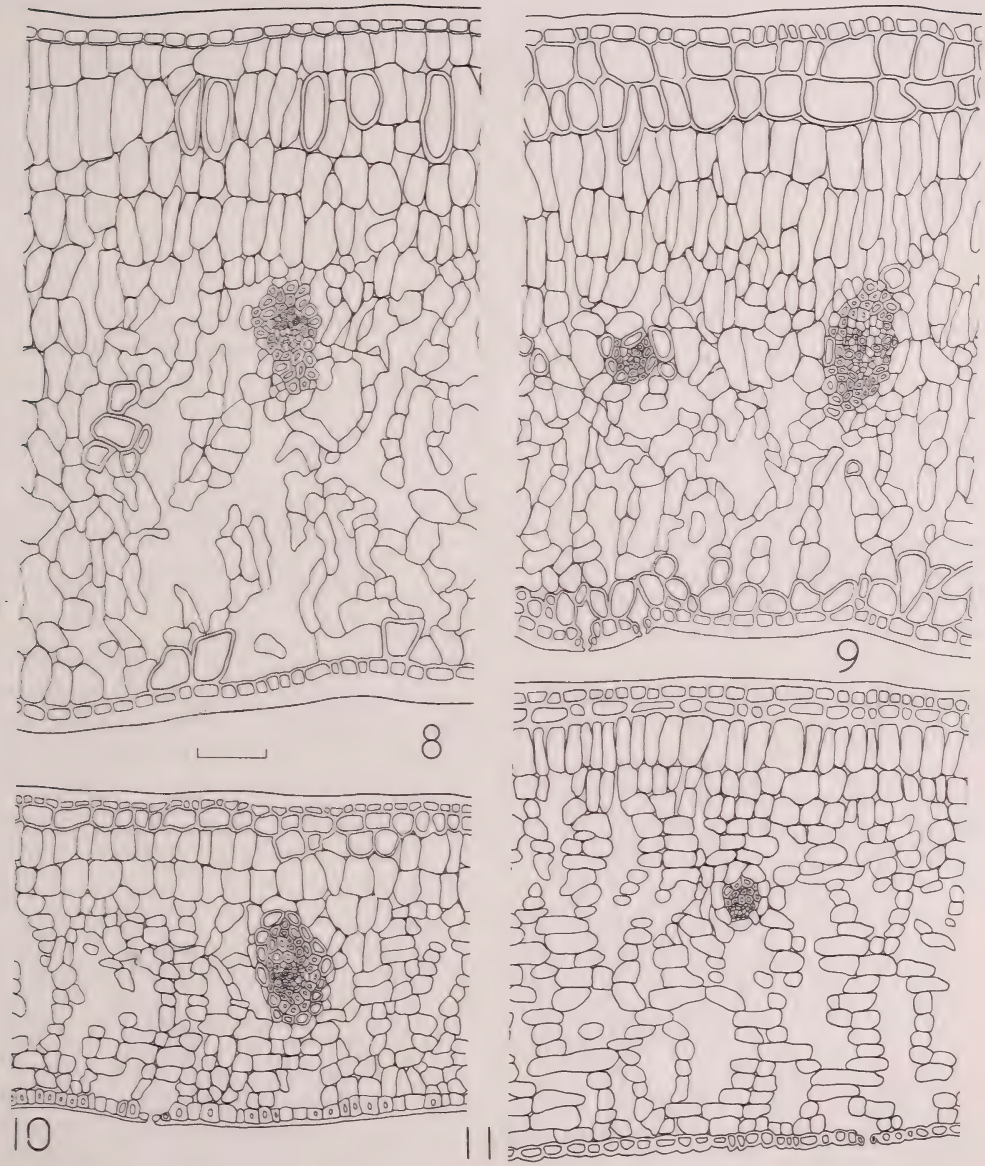
Considering that this group is fairly closely-knit, these divergences among genera within close alliances is noteworthy, and may probably best be explained on the basis of habit and leaf morphology in each genus. For example, the wide, sheathing bases of *Gongylolepis* leaves might be expected to be connected with a multilacunar condition, whereas the narrow or needle-like leaves of *Duidaea* seem correlated with a trilacunar situation. The phylogenetic significance of these differences, however, is difficult to interpret in the lack of adequate data for nodal conditions for the family. Both trilacunar and multilacunar nodes have been reported for the family (Sinnott 1914). It may be noteworthy in this connection that putatively primitive members of Heliantheae possess multilacunar nodes (Carlquist 1957d).

In genera with sessile leaves *(Stomatochaeta, Achnopogon, Duidaea)* little branching of traces takes place in the cortex subtending the leaf, or in the leaf base. In the petiolate taxa, however, the traces branch into a simple arc of numerous bundles in the petiole base. Lateral bundles of this arc may be branched in their extent in the cortex, shortly above their departure from the vascular cylinder. The disposition of fibers around leaf traces in the cortex, mentioned earlier, continues in the petiole, and becomes altered into bundle sheaths, considered below.

II. LEAF

The Guayana Mutisieae are notable for excessive complication in leaf anatomy. The only other member of the tribe for which leaf anatomy has been described in detail, *Hesperomannia* (Carlquist 1957c) is much simpler by comparison. *Hesperomannia* has a mesophyll undifferentiated into palisade and spongy tissue, and is otherwise unspecialized except in its sunken biseriate hairs.

Leaves of the genus *Stenopadus* (figs. 8–11) show examples of complicated leaf structure, as well as demonstrating considerable specific differentiation in anatomical details. Leaves in this genus all have a thick cuticle on both surfaces and relatively thick leaves, but vary in: relative thickness of mesophyll; presence or absence of a hypodermis on adaxial or abaxial surface, and thickness of it; number of palisade and spongy layers, if differentiated. These features may be conveniently summarized in tabular form (figures for spongy and palisade are approximate).



Figs. 8–11. Transections of *Stenopadus* leaves; adaxial face above. Fig. 8. *S. obconicus, Maguire 37077.* Fig. 9. *S. campestris, Maguire 35573.* Fig. 10. *S. cucullatus, Maguire 35720.* Fig. 11. *S. connellii, Wurdack 34265.*

	number of layers in adaxial hypodermis	number of layers in abaxial hypodermis	number of palisade parenchyma layers	number of spongy parenchyma layers
S. campestris (fig. 9)	2	1–2	3	7
S. connellii (fig. 11)	3	0	2	19
S. cucullatus (fig. 10)	1–2	0	2	11
S. huachamacari	2	0	9	15
S. kunhardtii	2–3	1–2	3	11
S. obconicus (fig. 8)	1–2	0	0	14
S. sericeus	3	0	2	12
S. stipitatus	0	0	3	11

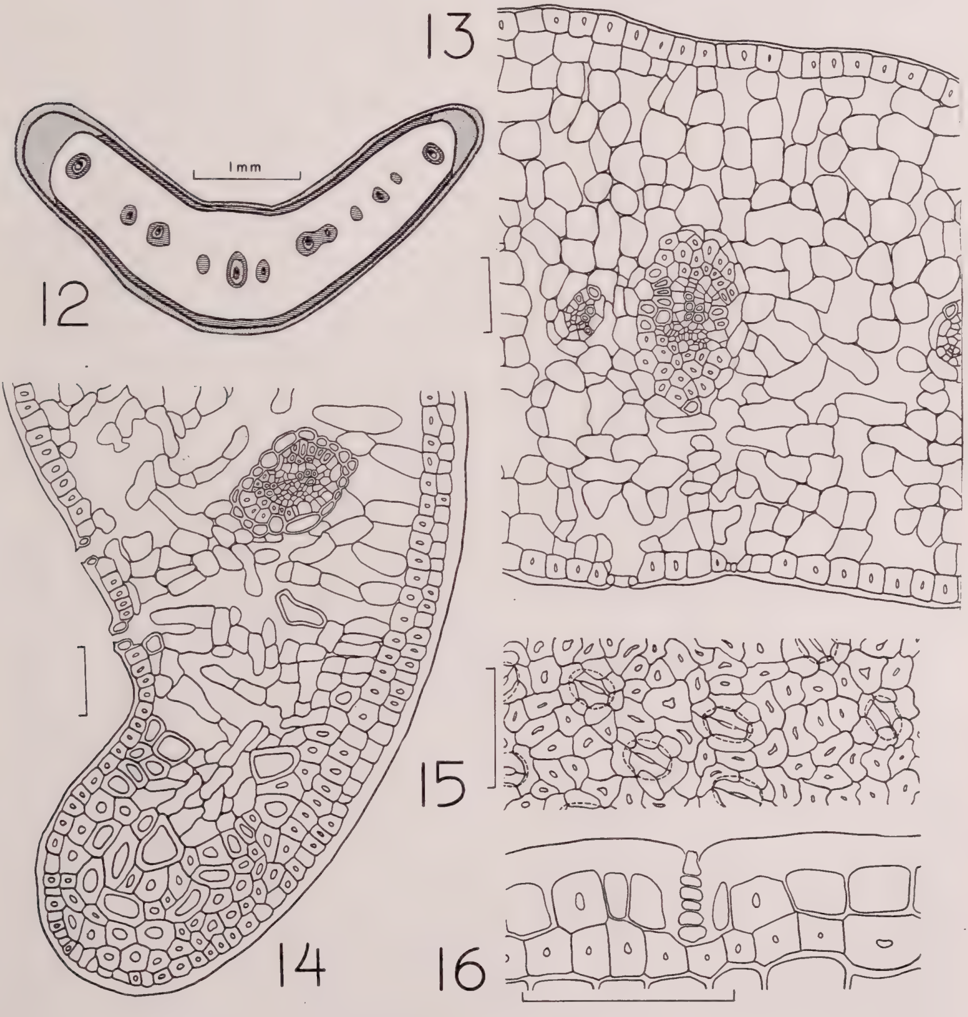
Variation among the species is found in other characters. Only one species, *S. cucullatus,* has bundle sheath extensions, these being present on a few larger veins. In *S. obconicus* and *S. huachamacari,* a few mesophyll cells are converted into thin-walled sclereids, mostly in layers near either epidermis. Bundle sheaths in some species *(S. kunhardtii, S. campestris, S. cucullatus,* and *S. stipitatus)* have abundant fibers, particularly on larger veins. Where fibers are well developed in the bundle sheath, they often intervene between phloem and xylem of the bundle itself. Some species are characterized by a sclerification of the lower epidermis (*S. cucullatus,* and, to a lesser extent, *S. sericeus* and *S. connellii*). Uniseriate hairs are retained on the lower surface of *S. sericeus leaves,* although the remaining species lose them early in ontogny, this variation being reminiscent of the situation in *Hesperomannia* (Carlquist 1957c).

Each of the species of *Stenopadus* investigated, then, has a distinctive combination of characters, so that identification of a species by means of leaf anatomy would be quite feasible. The specializations in leaf anatomy have probably occurred quite independently of other changes in this genus, and while the different types of anatomy described are diagnostic, they do not fall readily into a phylogenetic series or into sections of the genus. However, the conversion of the lower epidermis into sclereids and the presence of diffuse sclereids in the mesophyll would seem to be advanced characters.

Reference to leaves of other Mutisieae, subtribe Gochnatinae, aids both in showing that the patterns found in *Stenopadus* are relatively coherent, despite their diversity, and in demonstrating that both less specialized and more advanced conditions exist in other genera. In *Stifftia chrysantha* (fig. 29), which is considered related to *Stenopadus,* no true hypodermis is present, the mesophyll is only about 9 cell layers in width, with poor differentiation into palisade and spongy tissue, and bundle sheaths are strongly fibrous. Bundle sheaths of larger veins are often in contact with the adaxial epidermis. In another genus of Gochnatinae, *Anastraphia* (fig. 28), a more specialized condition is seen. Although the leaf is similar in thickness to that of *Stifftia,* a prominant hypodermis is present. Moreover, the very conspicuous fibrous bundle sheaths form extensions reaching from hypodermis to lower epidermis in all but the smaller veins. Between veins, sunken pockets, covered with hairs and containing stomata projecting above the epidermis, are formed. Such stomata have been reportd by Solereder for the closely-related genus *Gochnatia.* A definite division into palisade and spongy tissue occurs. In *Anastraphia,* then, some of the features of *Stenopadus* and *Stifftia* leaves are present in an exaggerated form.

Returning to Guayana Gochnatinae, the genera *Stomatochaeta* and *Chimantaea* present striking comparisons with *Stenopadus* in leaf anatomy. Both of these genera, although they vary in leaf shape, have characteristic anatomical features which are correlated with the gross morphology and texture of the leaves.

Some of the characteristics of *Stomatochaeta* leaves are shown diagrammatically in *S. cymbifolia,* figure 12. The epidermis of this species is unsclerified. A prominent hypodermis encircles the leaf, consisting of bands of thick-walled sclereids at the margins, and thin-walled sclereids in a single layer near both surfaces. Around the veins, thin-walled sclereids form a bundle sheath, and within this, on larger veins, a sheath of fibers is also present. No bundle sheath



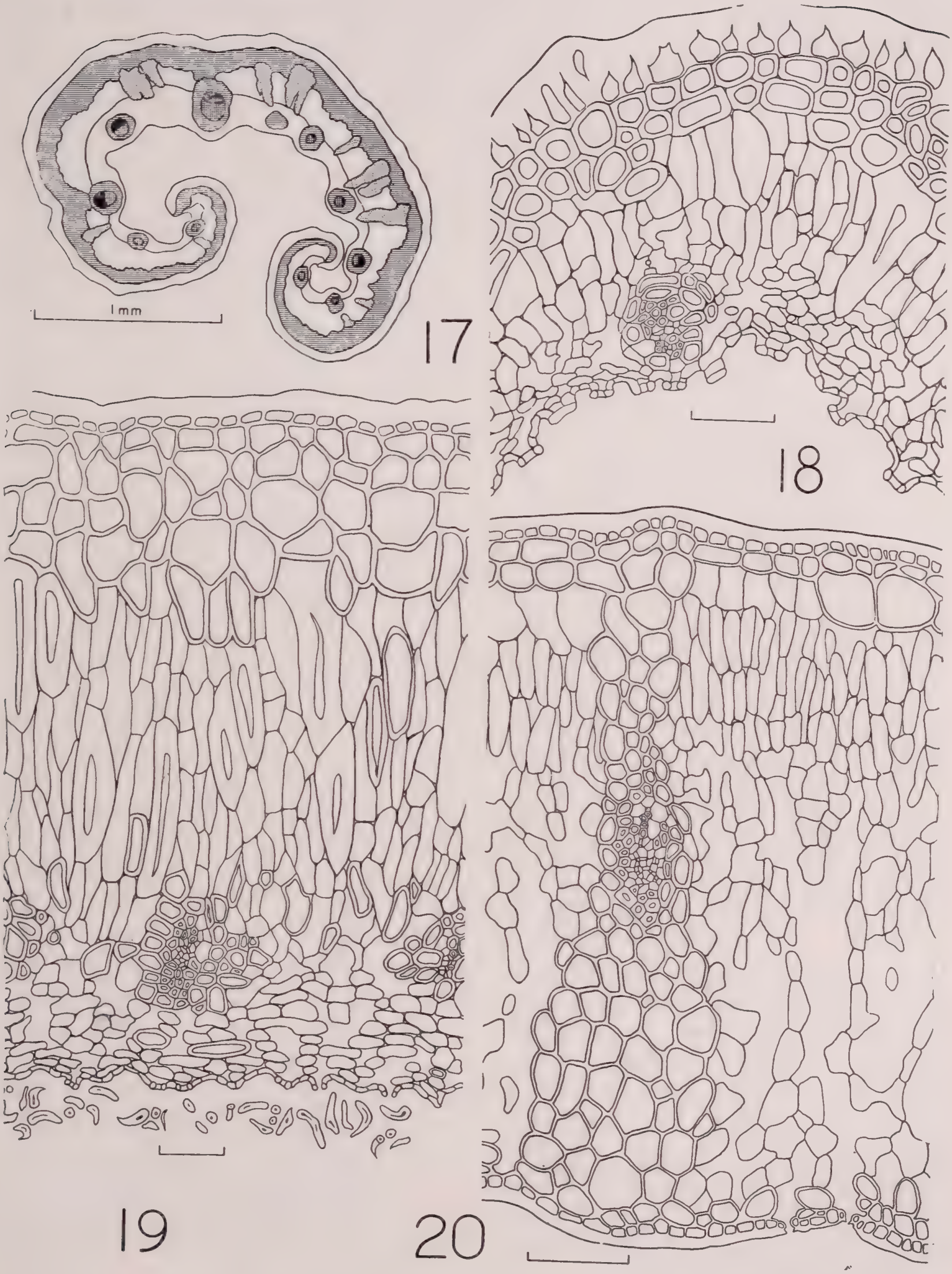
FIGS. 12–16. Sections of *Stomatochaeta* leaves. FIG. 12. *S. cymbifolia, Steyermark & Wurdack 508;* diagram of transection; symbols explained in text. FIG. 13. *S. condensata, Maguire 40603;* portion of leaf transection, adaxial face above. FIG. 14. *S. cylindrica, Maguire 32782;* transection of leaf margin, adaxial face of leaf at right. FIG. 15. Same, face view of epidermis. FIG. 16. Same, showing upper epidermis in transection; note abortive hair.

extensions are formed, however . The mesophyll consists wholly of spongy parenchyma cells, some of which become lightly sclerified at maturity. Although the leaves of *S. condensata* (fig. 13) are broader, the anatomy is much the same as that of *S. cymbifolia.* No hypodermis is present, however, and the subepidermal sclerenchyma in the leaf margins is not so extensive as that of *S. cymbifolia.* In *Stomatochaeta cylindrica* (fig. 14), a sclerified epidermis is present on the lower surface, but on the adaxial surface a sclerified hypodermis and non-sclerified epidermis are formed. In addition, a division into four layers of loosely arranged palisade and nine layers of spongy parenchyma occurs in the mesophyll of *S. cylindrica* leaves. The sclerenchyma of the margin (fig. 14, below) is approximately as in *S. condensata.* Details of the epidemis of *S. cylindrica* are shown in figures 15 and 16. In figure 15, a surface view of the abaxial epidermis shows the thick-walled sclereids, often irregular in outline, which compose the entire epidermis with the exception of the guard cells and a single circle of cells surrounding each stoma. Guard cells are slightly external to adjacent epidermal cells, and the portions of guard cells which overlap epidermal cells are shown by dotted lines. Figure 16 illustrates the extremely thick cuticle which occurs on both surfaces of leaves of all species of *Stomatochaeta* studied. Also noteworthy is the occurrence of sunken hairs; these trichomes consist of a tier of rather short, wide cells, and do not project above the surface in mature leaves. Such abortive hairs, sunken into cuticle, are apparently characteristic of several taxa investigated, since they were observed also in *Stenopadus* and *Quelchia.*

The genus *Chimantaea* (figs. 17–19) shows a highly individual series of features. Characters common to all species studied include an unsclerified adaxial epidermis with extremely thick cuticle, a prominent hypodermis at least two cells in thickness, subhypodermal sclereids with extremely thick walls scattered among the palisade cells, presence of spongy parenchyma, lower epidermis with relatively thin cuticle and exserted stomata, and an abundant development of uniseriate thick-walled trichomes on the lower surface.

Chimantaea mirabilis (figs. 17, 18) has narrow leaves with inrolled margins. The epidermal cells are large, usually tapered toward the outside surface. The hypodermis, which is 2–4 cells in thickness, is composed of sclereids. About 3 layers of palisade and three of spongy parenchyma are present. Occasional in the palisade are enormous thick-walled sclereids, which span the distance between hypodermis and spongy parenchyma. The bundle sheath of veins consists of thin-walled sclereids, and although these cells are continuous with the hypodermis, which is composed of similar cells, such contact is not made between vein sheaths and the lower epidermis of larger veins. Consequently, sheath extensions cannot be said to be present.

Although the leaves of *Chimantaea mirabilis* show the most extreme specialization in their inrolled margins and exceptional developments of sclerenchyma, the other species also show a degree of expression of such features. *Chimantaea similis* (fig 19), *C. rupicola*, and *C. lanocaulis* agree in having small epidermal cells, which are flat rather than tapered. The hypodermis in these species is formed of sclerenchyma much more thin-walled than in *C. mirabilis*, although it is wider, consisting of 4 or 5 cell-layers. Thick-walled mesophyll sclereids are abundant, usually occurring in groups. Such sclereids are not as long as the width of the palidsade, however. In all three species, approximately five layers of palisade and five of spongy parenchyma are present. The foliar anatomy of *Chiman-*



FIGS. 17–20. Transections of leaves, adaxial face above. FIG 17. *Chimantaea mirabilis, Steyermark & Wurdack 821;* diagram (symbols explained in text). FIG. 18. Same, portion of leaf transection. FIG. 19. *C. similis, Steyermark 605;* portion of leaf transection. FIG. 20. *Quelchia cardonae, Steyermark & Wurdack 565;* portiton of leaf transection.

taca is in certain respects like that figured by Marloth (The Flora of South Africa, Vol. 3, Pt. 2, 1932) for another genus of Gochnatinae, *Oldenburgia*. *Chimantaea* differs in its thick sclereid-bearing palisade; the palisade of *Oldenburgia* is narrow and composed of thin-walled cells. The similarities between the two genera probably represent parallel adjustments to xeric situations.

The other genus of Guayana Gochnatinae, *Quelchia* (fig. 20) is distinguishable in its leaf anatomy from the preceding by virtue of the fact that thin-walled sclereids form bundle sheath extensions on the larger veins. The two species studied, *Q. bracteata* and *Q. cardonae*, have extensions composed of cells identical in shape and wall thickness to those of the hypodermis. The adaxial hypodermis is approximately two cells in thickness, and a single layer of cells composes the abaxial hypodermis. Cells appearing to be laticiferous by virtue of contents and large size occur in the adaxial hypodermis. A division into three or four layers of palisade and about ten of spongy parenchyma occurs. A prominent cuticle is present on both upper and lower epidermis.

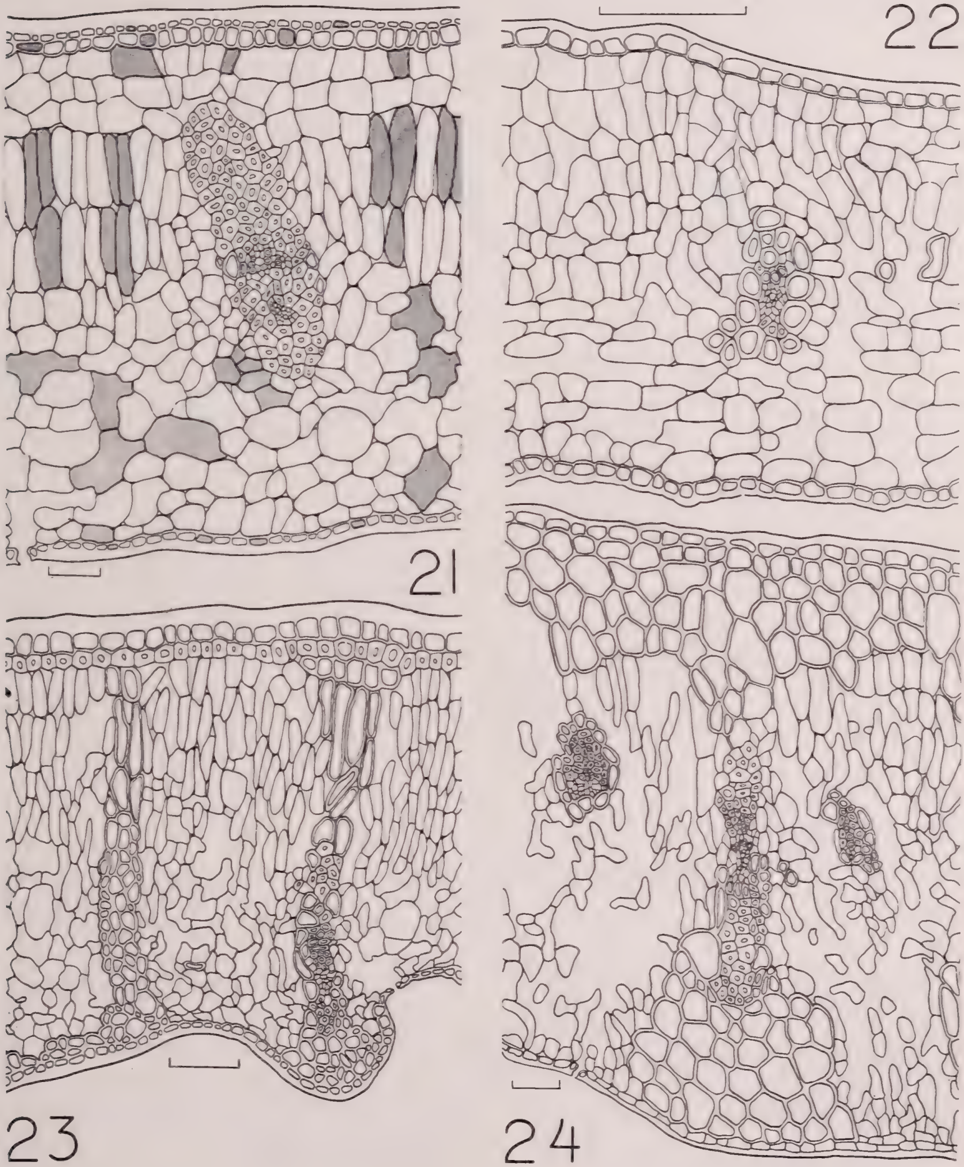
Among Gerberinae, the genus *Gongylolepis* (figs. 21, 22) is least specialized in its leaf anatomy. From liquid-preserved material of *G. huachamacari* subsp. *neblinensis* (fig. 21), the distribution of laticiferous cells could be determined. Cells containing latex occur in both upper and lower epidermis, in all layers of the adaxial hypodermis, and in spongy and palisade parenchyma. *Gongylolepis huachamacari* subsp. *neblinensis* exhibits an advance over other species of the genus in possessing a hypodermis which consists of a single layer of small thick-walled cells, together with two layers of parenchyma only slightly more thick-walled than palisade cells. A bundle sheath extension is present on most veins. Within the bundle sheath, an exceptional development of fibers is seen; these often extend to both epidermises, and intervene between the phloem and xylem of a vein. Approximately two layers of palisade and seven of spongy parenchyma are characteristic of *G. huachamacari* subsp. *neblinensis*. In *G. martiana* (fig. 22), a condition more typical of the genus may be observed. One or two layers of hypodermis are present on the adaxial surface. The bundle sheath is highly fibrous, and extends to both surfaces in larger veins, forming extensions. Approximately three palisade and seven spongy layers are present.

Among species of *Gongylolepis* investigated which are not illustrated, *G. huachamacari* and *G. bracteata* differ from *G. martiana* in having a thicker leaf, with 4 or 5 hypodermal, three palisade, and about 12 spongy layers. The bundle sheath and sheath extensions consist of cells like those of the hypodermis, rather than being composed of fibers. Fibers are, however, present immediately adjacent to the bundles. The spongy cells immediately adjacent to the lower epidermis are often thickened, suggesting the development of a hypodermis on the lower surface. *Gongylolepis fruticosa*, a rather specialized species, shows notable differences in that the leaves are isolateral, with 3–5 layers of hypodermis on each surface, separated by 7 or 8 layers of spongy parenchyma. Bundle sheaths and sheath extensions are as in *G. huachamacari*.

The genus *Neblinaea*, not illustrated, easily fits into the range of variation found in *Gongylolepis*. The description above of *G. huachamacari* could be applied to the only species, *N. promontorium*, except for the narrower hypodemis (2 cell-layers), palisade (2–3 cells), and spongy tissue (about 5 cells).

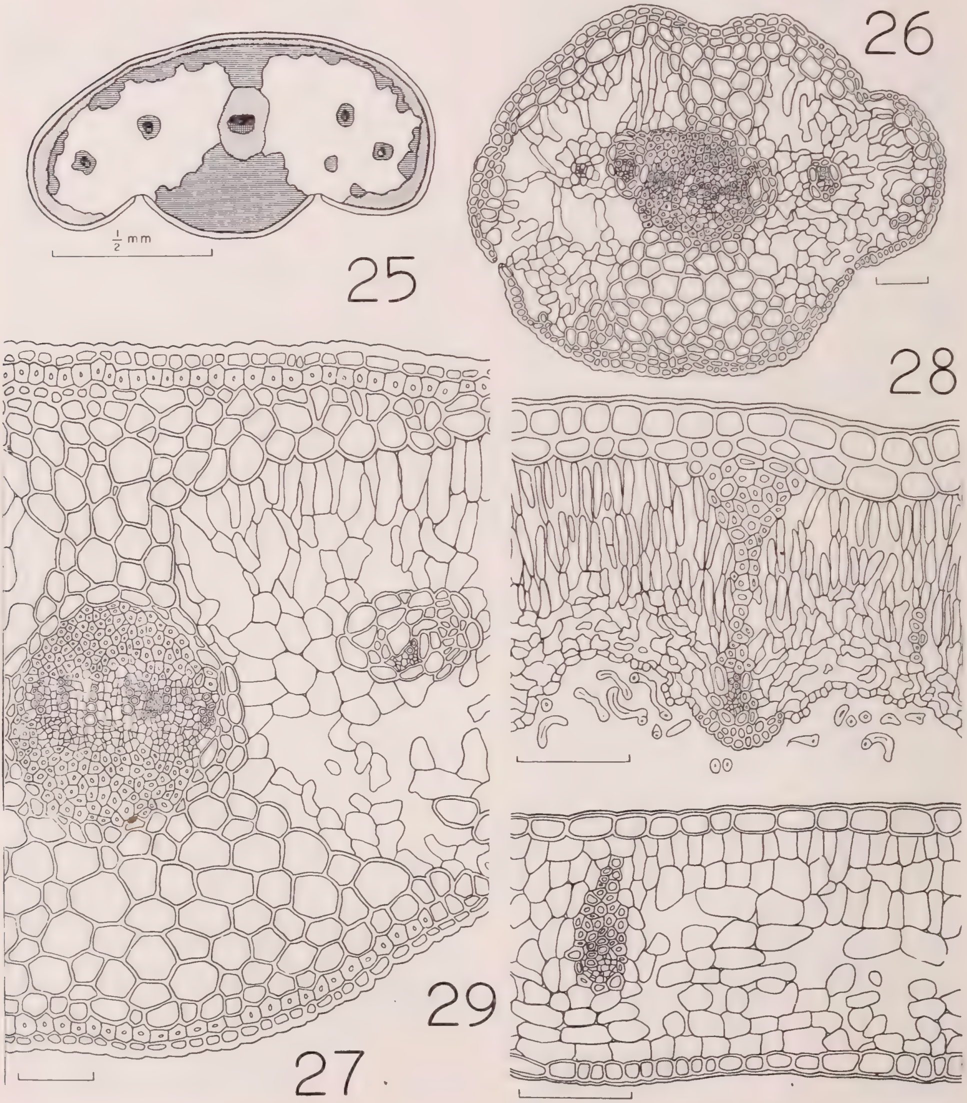
Achnopogon and *Duidaea*, by contrast, show remarkable specializations. The single species of *Achnopogon* (fig. 24) has a leaf anatomy basically similar to that of species of *Gongylolepis.* Bundle sheath extensions are more conspicuous, however. Although the three layers of palisade are loosely arranged, they can be differentiated from approximately seven spongy layers. No hypodermis is present on the abaxial surface between the bundle sheath extensions.

Similar features are seen in leaves of *Duidaea* (figs. 25–27); they are how-



Figs. 21–24. Transections of leaves, adaxial face above. Fig. 21. *Gongylolepis huachamacari* subsp. *neblinensis, Maguire, Wurdack & Bunting 37353;* laticiferous cells shaded. Fig. 22. *G. martiana, Schultes 5742.* Fig. 23. *Glossarion rhodanthum, Maguire, Wurdack & Bunting 37190.* Fig. 24. *Achnopogon virgatus, Steyermark & Wurdack 742.*

ever, modified in accordance with the narrow, in some species needle-like, shape. In each of the three species studied, a prominent extension is present on the bundle sheath of the midvein, although lateral veins lack them. Little differentiation into palisade and spongy parenchyma can be discerned, except in *D. rubiceps* (fig. 27), where two layers of palisade and seven of spongy tissue may be recognized. Thick cuticle is present on both surfaces of the leaves of all species. Stomata in *Duidaea* leaves are confined to the lower surface on either side



FIGS. 25–29. Transections of leaves, adaxial face above. FIG. 25. *Duidaea tatei, Steyermark 58204*; diagram (symbols explained in text). FIG. 26. *D. pinifolia, Steyermark 58143*; transection entire leaf. FIG. 27. *D. rubriceps, Tate 1042*; portion of transection including midvein. FIG. 28. *Anastraphia cowellii, Howard 5098* (A); portion of transection. FIG. 29. *Stifftia chrysantha, Trinidad Bot. Gard. 1330.* (GH); portion of transection.

of the midvein sheath extension (see figs. 25, 26). Fibers are abundantly present around the midvein in this genus, although lacking in the lateral veins; lateral veins are, however, jacketed by cells like those of the midvein sheath extension. The three species of *Duidaea* may be very easily separated on the basis of hypodermal sclerenchyma. *Duidaea tatei* (fig. 25) has a prominent adaxial hypodermis, composed of sclereids, which extends around the margins, where it is broader. *Duidaea pinifolia* (fig. 26), on the contrary, is entirely lacking in such sclereids. *Duidaea rubriceps* (fig. 27) possesses a hypodermis a single layer thick (except at the margins, where it is two cells in thickness) which completely encircles the leaf.

The leaf of *Glossarion* (fig. 23) combines features of many of the taxa described above, although it cannot be referred to any particular genus. A thick cuticle is present on both upper and lower epidermis. A hypodermis, consisting of a single layer of small isodiametric sclereids, occurs on the adaxial face. One feature not seen in any of the other genera is the elongate shape of the thin-walled sclereids composing the adaxial half of bundle sheath extensions. The lower half of the sheath extension consists of isodiametric thin-walled sclerenchmya, which also forms sheaths on smaller veins not possessing extensions. No hypodermis is present adjacent to the lower epidermis; numerous uniseriate hairs, not shown in the portion illustrated, characteristically occur on the lower epidermis.

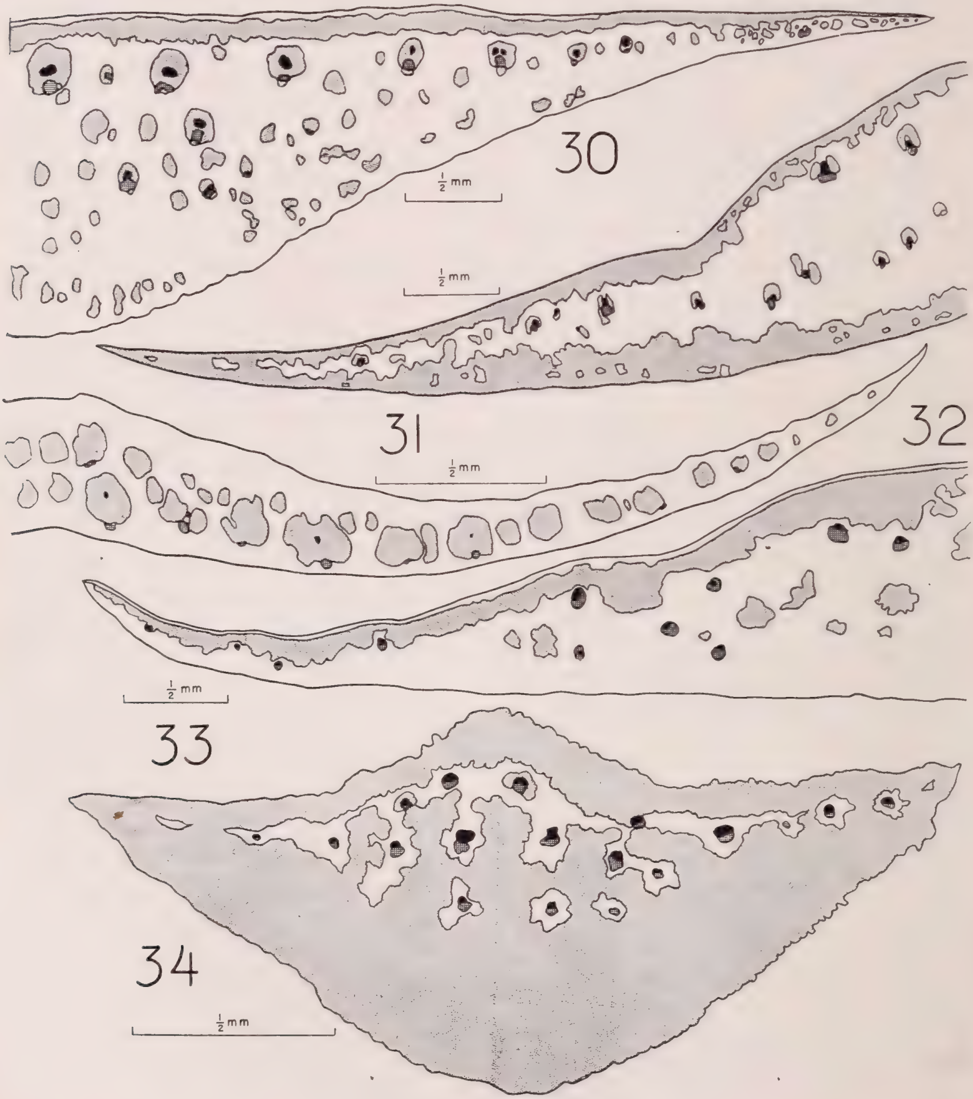
In summary, excellent generic distinctions are present among most of the genera, such as *Stomatochaeta*, *Chimantaea*, *Duidaea*, and *Glossarion*. The leaves of *Stenopadus* could be distinguished from those of *Gongylolepis* by means of the presence of laticiferous cells in the latter. The leaves of *Stenopadus*, in addition, tend to be much thicker than those of *Gongylolepis*. *Quelchia* leaves resemble those of both *Stenopadus* and *Gongylolepis*, although they are closer to the latter in possession of bundle sheath extensions (absent from *Stenopadus* except for *S. cucullatus*) and laticiferous cells. Leaves of *Achnopogon* and *Neblinaea* are within the range of variation found in *Gongylolepis*.

The complex structure of leaves in Guayana Mutisieae, their abundant sclerenchyma or thick-walled parenchyma, massive cuticles, and possession of bundle sheath extensions are features usually associated with plants of habitats dry during at least part of a year. The leaf structure of such species as *Chimantaea mirabilis* is what one would expect to find in a rather xeric environment, in fact. One notable feature which is found in most of the genera is a development to some extent of a hypodermis, a structure which occurs (together with sheath extension) in such a distant mutisioid as *Nouelia*. The absence of hypodermis in such genera as *Stifftia* and *Hesperomannia* (Carlquist 1957c) does indicate that although it is a widespread phenomenon in the tribe, it is not a universal one.

Although investigations of leaf anatomy of other mutisioids are apparently lacking, comparisons can be made with other Compositae. Hypodermis has been reported in species of *Celmisia* (Astereae) and in *Senecio munroi* by Solereder (1908), and in *Veronia luschnathiana* by Grimm (1904). Bundle sheath extensions are apparently not infrequent in the family, as is indicated by reports of their occurrence in various species by Betts (1920), Shields (1951) and Carlquist (1957d). In none of the genera studied by these authors, however, does there appear to be such a conspicuous representation of sclerenchyma; the exceptional development of such cells in leaves, as well as in other parts, appears to be characteristic of Mutisieae.

III. INVOLUCRE

Structure of involucral bracts within a single species varies from outer to inner bracts. Likewise, the tip of a bract may differ in anatomy from the base.



FIGS. 30–34. Diagrams of transections of outer involucral bracts, adaxial face above (symbols explained in text). FIG. 30. *Stenopadus connellii, Wurdack 34265.* FIG. 31. *Stenopadus cucullatus, Maguire 35120.* FIG. 32. *Stifftia chrysantha, Trin. Bot. Gard. 1330* (GH);. FIG. 33. *Wunderlichia mirabilis, Glaziou 2168G* (UC). FIG. 34. *Chimantaea similis, Steyermark & Wurdack 605.*

Differences between base and apex are usually in the nature of a greater prominence of parenchyma and more numerous bundles near the base. A section midway along the length of a bract gives a reasonable idea of the nature of its structure, and so such sections were employed in this study, unless otherwise noted. The variation from outer to inner bracts, however, may take various forms and must be considered when comparisons among taxa are made. Receptacular bracts, if present, represent the most extreme expression of the series from outer to inner.

In the genus *Stenopadus,* variations in involucral bract structure occur chiefly in the relative amount and distribution of sclerenchyma. Figures 30 and 31 show diagrammatic transections of outer involucral bracts of *S. connellii* and *S. cucullatus* respectively, and portions of inner bracts are shown in cellular detail in figure 35 for *S. campestris* and in figure 38 for *S. cucullatus.*

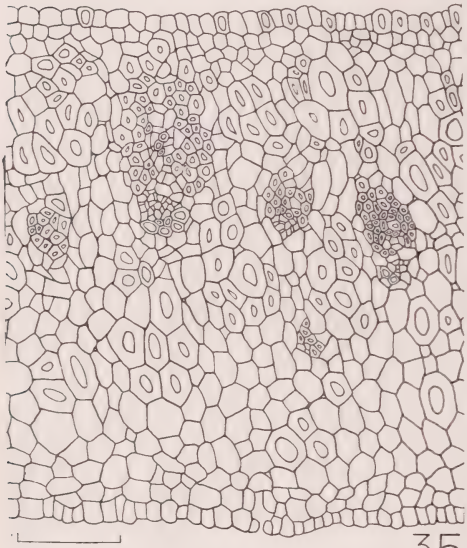
Comparison of outer and inner bracts for a single species, *S. cucullatus* (figs. 31, 38), shows differences in thickness of sclerenchyma on each face of the bract and in number of bundles present. In both, however, the epidermis and several underlying layers on both sides of the bract consist of thick-walled sclereids. In the vascular bundles, fibers or isodiametric sclereids surround most of the bundle; they do not, however, separate xylem from phloem. There are few fiber groups in the mesophyll of bracts which are not directly related to bundles.

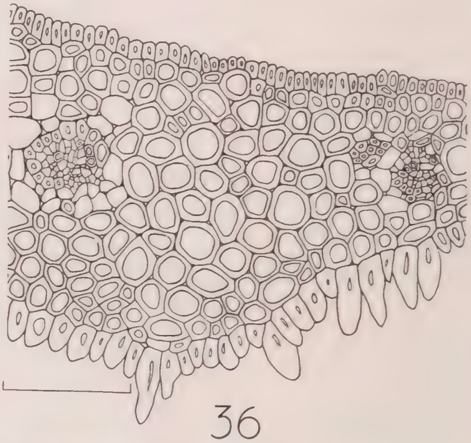
In *S. connellii* (fig. 30) the distribution of sclerenchyma is quite different. One or two layers on the inner face of the bract are unsclerified, although a thick band of sclereids is present below the surface on this face of the bract. The outer face of the bract is not sclerified, although individual sclereids or nests of sclereids occur throughout the mesophyll of the bract, unlike the condition in *S. cucullatus.* Sclerification is conspicuous in association with the bundles: the xylem pole of each strand is often completely surrounded, with the phloem lying on the abaxial face of this fibro-sclereid sheath. In addition, a fibrous bundle cap is formed adjacent to the phloem. Inner bracts of *S. connellii,* however, are like those of *S. cucullatus* in that both surfaces of the bract are sclerenchymatous, and although fibers occur in association with the bundles, no sclerenchyma other than this is found in the mesophyll, which consists of thin-walled parenchyma.

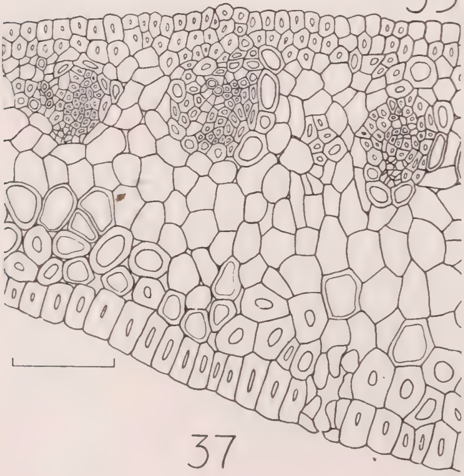
Stenopadus campestris (fig. 35) does not agree with either of the two above species in that although the outer bracts are like those of *S. connellii,* the structure of the inner bracts is different from that of *S. connellii.* Sclerenchyma, rather than being present on both faces, is more frequent toward the inner face, and occurs in the form of nests or individual sclereids. Sclereids are much less frequent toward the outer face of the bract. Among other species of *Stenopadus* investigated, *S. kunhardtii* and *S. stipitatus* agree with the types of bracts which occur in *S. campestris; S. obconicus* has inner bracts like those of *S. cucullatus.*

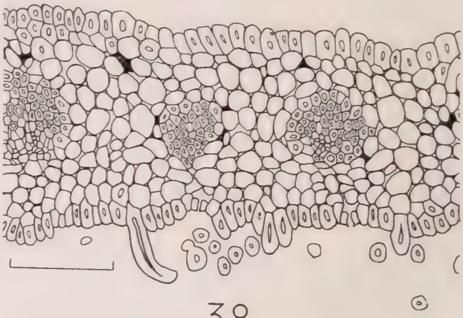
A difference was noted above between the excessive fiber development in *S. connellii* and the fibrous sheaths of bundles in *S. cucullatus* outer bracts, in which an area of fibers (horseshoe-shaped in transection) often surrounds the bundle, but does not separate xylem from phloem. Among the other species of *Stenopadus* studied, *S. obconicus* resembles *S. cucullatus* in this respect, whereas *S. campestris, S. kunhardtii,* and *S. stipitatus* are like *S. connellii* in such characteristics of bundles in outer bracts. Bundles of inner bracts tend to be alike in all the species, with a more or less complete cylindrical sheath of fibers surrounding vascular elements but not separating xylem from phloem. The presence of carbonized resin deposits, among both parenchyma and sclerenchyma cells, was noted in bracts of several species of *Stenopadus*.

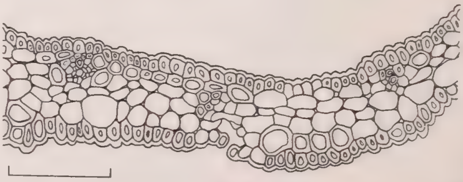
Stomatochaeta (fig. 37) possesses bract structure similar to that of the inner bracts of *Stenopadus cucullatus*. As demonstrated by the bract of *Stomatochaeta cylindrica* shown in figure 37, however, a marked difference occurs between the the large-celled sclerenchyma on the outer face of the bract and the much smaller sclereids on the inner face. Inner bracts of *Stomatochaeta* are similar, except that sclereids on the outer face of the bract grade into the thin-walled


35


36


37


38


39

FIGS. 35–39. Portions of transections of involucral bracts, adaxial face above. FIG. 35. *Stenopadus campestris, Maguire 35573;* inner bract. FIG. 36. *Chimantaea similis, Steyermark & Wurdack 605;* inner bract. FIG. 37. *Stomatochaeta cylindrica, Maguire 32782;* outer bract. FIG. 38. *Stenopadus cucullatus, Maguire 35120;* inner bract. FIG. 39. *Quelchia cardonae, Steyermark & Wurdack 565;* inner bract.

parenchyma gradually, so that cells with walls of intermediate thickness may be found beneath the abaxial sclerenchyma. No nests of sclereids, however, are present in the mesophyll of bracts, although bundles are very prominently encased by fibers. In outer bracts, xylem and phloem of bundles are frequently separated by such fibers.

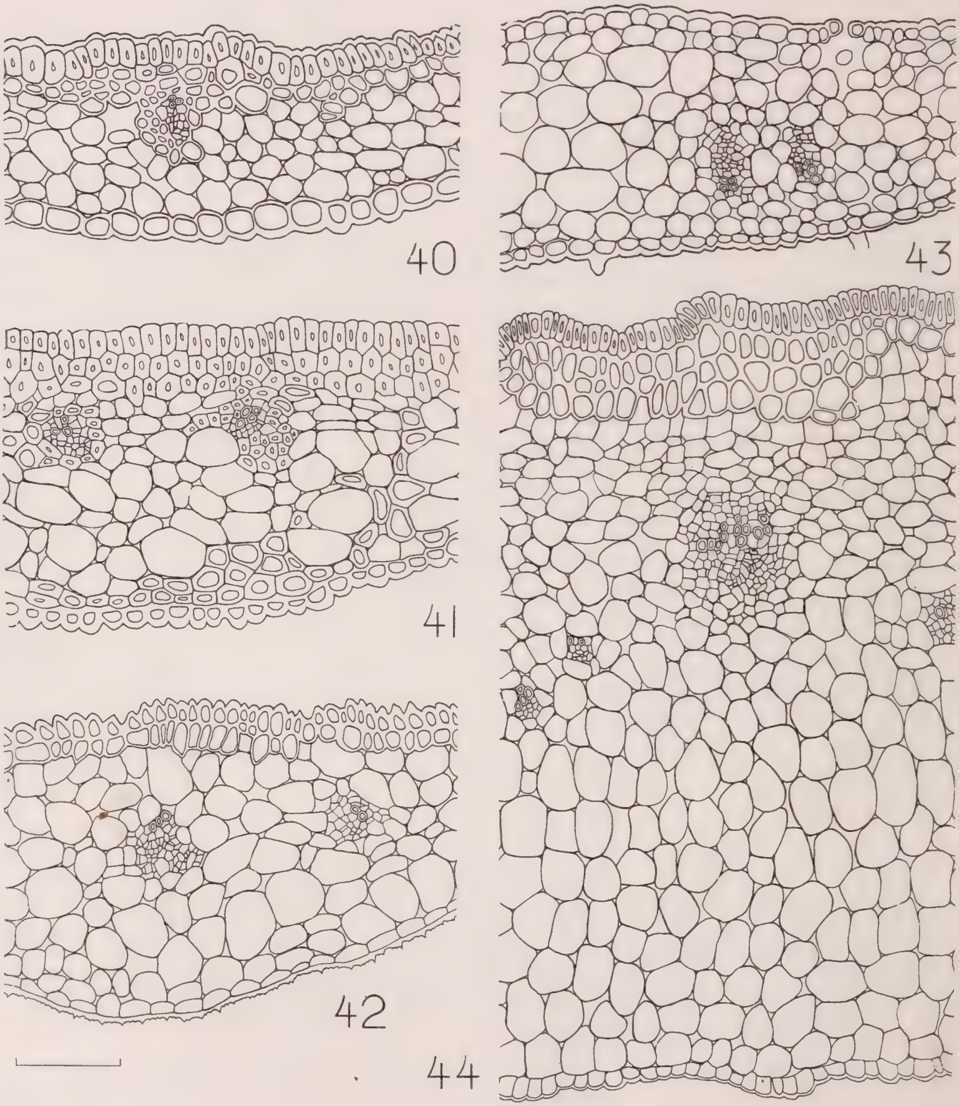
The bracts of *Chimantaea* (figs. 34, 36) are distinctive in having more abundant sclerenchyma development than any of the preceding. This sclerenchyma, however, is not disposed as in *Stenopadus* or *Stomatochaeta*, since neither fibrous bundle sheaths nor nests of sclereids are present. Instead, the entire bract, both inner and outer, is converted into sclerenchyma except for a small band (in outer bracts, fig. 34) or occasional pockets (in inner bracts, fig. 36) of thin-walled parenchyma on which the vascular bundles are located. In their extremely woody structure, these bracts surpass those of other genera in this study.

Involucral bracts of *Quelchia* (fig. 39), although they are thinner, have a combination of characters which does not match those of the above genera. The adaxial epidermis, and parts of one layer beneath it, are sclerified, as is the abaxial epidermis, but the remainder of the bract is thin-walled parenchyma. No fibrous bundle sheaths are present. The outer bracts have the structure shown for an inner bract of *Q. cardonae* in figure 39 except that the abaxial epidermis is unsclerified.

Comparisons with other Gochnatinae seem pertinent here, both for demonstrating the relative similarity of bract structure, despite certain differences, in the four above genera, and for showing the diversity to be found in putatively closely-related members of this tribe. The only other mutisioid for which information on bract structure is available is *Hesperomannia* (Carlquist 1957c), so that two other genera, which are probably not distantly related to Guayana Gochnatinae, are described here. *Stifftia* (fig. 32) is notably different in that its bracts, although they have a texture like that of *Chimantaea* bracts, have an entirely different development of sclerenchyma. The adaxial epidermis may be sclerified. All other sclerenchyma in the bract, however, is in the form of discrete fiber bundles, and no isodiametric sclereids are present in the mesophyll. Some of these fiber bundles contain vascular components, although vascular tissue in bracts of *Stifftia* is at a minimum. Where xylem is present, it occurs in the center of one of these fiber strands, with the phloem at the outside of the strand separated from it by numerous fibers.

The involucral bracts of *Wunderlichia* (fig. 33) are notable in that a prominent band of sclerenchyma covers the inner face with the exception of the epidermis. In this respect it resembles the bract of *Stenopadus connellii* shown in figure 30. In contrast to *S. connellii*, however, no sclerenchyma of any kind is associated with the vascular bundles. Groups of parenchyma cells may develop into mesophyll sclereids which are much larger and more thin-walled than those of the adaxial sclerenchyma.

A quite different pattern is illustrated by the involucral bracts of *Hesperomannia* (Carlquist 1957c). In this genus, no sclerenchymatous sheath is present on bundles. A thin band of sclerenchyma is present on the inner face of the bract including the epidermis, and there is a rather prominent development of fibers toward the outer face. The latter sclerenchyma may be outside of or intercalated between the bundles. A similar pattern occurs in *Anastraphia cowellii* (*Howard 5098*, GH) with the exception that in addition to the isolated band of fibers near the outside of the bract (interior to which are the bundles), the outer epidermis is sclerified. Two to three layers of sclerenchyma are present on the inner face of the bract; thus, three distinctive bands of sclerenchyma are present. Vascular bundles are mostly without associated fibers. In all characters except the abaxial epidermis, bract structure in *Anastraphia cowellii* is close to that of *Hesperomannia*.



FIGS. 40–44. Portions of transections of involucral bracts, adaxial face above. FIG. 40. *Achnopogon virgatus, Steyermark & Wurdack 742.* FIG. 41. *Glossarion rhodanthum, Maguire, Wurdack & Bunting 37190;* outer bract. FIG. 42. *Duidaea rubriceps, Tate 1042;* inner bract. FIG. 43. *Gongylolepis huachamacari, Maguire et al. 30262;* inner bract. FIG. 44. *Gongylolepis martiana, Schultes 5742* (GH); outer bract.

In Guayana genera of the subtribe Gerberinae, a contrasting condition to all of the above can be seen in the genus *Gongylolepis* (figs. 43, 44). Sclerenchyma in *Gongylolepis* is notably absent. In the outermost bracts of *G. martiana* (fig. 44), the adaxial epidermis is sclerified and 2–4 underlying cell layers have moderately thick walls, but no other sclerification occurs in the ground tissue of the bract. Fibers are absent around vascular bundles. Cells in the abaxial half of the bract have contents which suggest the laticiferous-resinous content of cells elsewhere in the plant. In *G. huachamacari* (fig. 43), inner bracts show no sclerenchyma, and even outer bracts lack it altogether. The very fleshy texture of bracts in *Gongylolepis,* then, is in marked contrast with the bracts of genera described above.

The other genera of Guayana Gerberinae show clear relationship to *Gongylolepis* in bract structure, although they are somewhat more specialized. The condition in *Achnopogon* (fig. 40) is virtually identical with that described for *Gongylolepis martianus,* although the bracts are thinner. Thick-walled parenchyma cells occur beneath the sclerified inner epidermis. In inner bracts, no sclerenchyma is present except in the inner epidermis. No fibers or true sclerenchyma surround the vascular bundles.

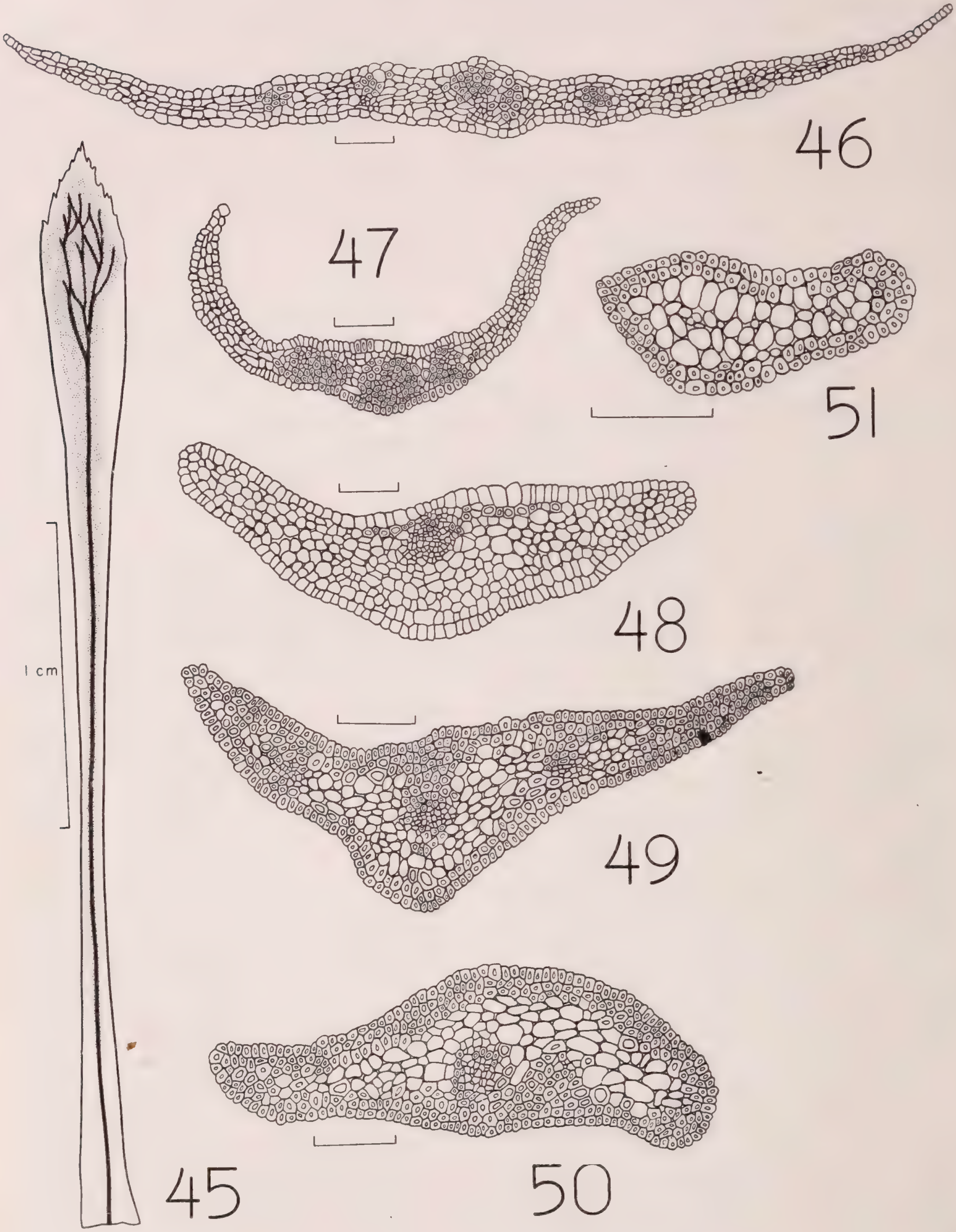
In *Duidaea* (fig. 42), precisely the same pattern is seen. As shown for *D. rubriceps,* however, no sclerenchyma is present, only parenchyma with moderately thick lignified walls, forming a single hypodermal layer. Such cells may also be present around the vascular bundles, particularly in the basal portions of the bracts. One or two layers of fibers were found to be present on the adaxial face of bracts of *D. tatei.*

Bracts of *Neblinaea* are not unlike those of *Duidaea* or *Achnopogon* except that they contain a single layer of fibers on both faces of the bract. In addition, fibers also encase the vascular bundles. Within the Guayana Gerberinae, then, some differentiation along generic lines has taken place in respect to bract structure, although the unity of the group is evident.

This unity is evident if comparison is made with another genus placed in Gerberinae (Mutisinae of Hoffman, 1880), *Nouelia.* In outer bracts of *N. insignis* (*Rock 11714,* A) a thick band of sclerenchyma, including the epidermis, forms the inner face. The abaxial epidermis likewise is sclerified. Bundles are sheathed with fibers, although additional strands consisting wholly of fibers are present. Inner bracts differ only in that the adaxial epidermis alone is sclerified, the fibrous bundle sheaths being as in the outer bracts.

The genus *Glossarion* is anomalous in respect to bract structure, just as it is in other features. The bract shown in figure 41 shows an unsclerified outer epidermis with thick cuticle overlying 2–3 cell-layers of thin-walled sclerenchyma, which contrasts with the markedly sclerified cells on the inner face of the bract. Fibers encase the vascular elements. Within the thin-walled parenchyma cells of the mesophyll, there is wide variation in cell size. In lower portions of bracts of *Glossarion,* the parenchyma is more uniform, and all cells of the bract except the vascular bundles and the sclerenchyma on the inner face could be classified as thick-walled parenchyma. While the bract structure of *Glossarion* is not unlike that of several genera considered here, particularly *Stenopadus,* it cannot be clearly referred to any of them.

Receptacular Bracts. Only a small minority of Mutisieae possess receptacular bracts. Because two genera included in this study (*Stenopadus* and *Stomato-*



FIGS. 45-51. Receptacular bracts. FIG. 45. *Stenopadus cucullatus, Maguire 35029*; entire bract, showing distribution of veins (black) and fibers (stippled). FIGS. 46–48. *S. kunhardtii, Maguire 27896*; transections of top, middle, and base of bract, respectively; adaxial face above. FIG. 49. *S. cucullatus, Maguire 35120*; transection of bract in upper portion. FIG. 50. *Stomatochaeta cylindrica, Maguire 32782*; transection of bract. FIG. 51. *Wunderlichia mirabilis, Glaziou 2168G* (UC); transection of upper portion of bract.

chaeta) do have them, and since they are relatively similar in anatomy to inner involucral bracts, rather than being bristle-like as in some Mutisieae and Cynareae, they are worthy of consideration. Most authors dealing with evolution in Compositae (e.g., Cronquist 1955) regard the presence of receptacular bracts as primitive.

An entire receptacular bract of *Stenopadus cucullatus* is shown in figure 45. Along most of its length, a single vascular bundle is present. Upwardly, however, this forms a number of branches. Although at the base of the bract no fibers jacket the vein, the upper portions of the vascular system are intimately clothed with fibers. A transection of a receptacular bract taken above the point of vein branching is shown in figure 49. In addition to the fibers associated with the veins, sclereids are present in the ground tissue of the bract, and the entire epidermis consists of sclerenchyma. This condition is reminiscent of the anatomy of involucral bracts in *S. cucullatus.* Likewise, the anatomy of the receptacular bract of *S. kunhardtii* (figs. 46–48) is similar to the structure of involucral bracts in that species in the relative paucity of sclereids. Except in the basal transection (fig. 48), sclereids are rare in the ground tissue, although an occasional epidermal cell (figs. 46, 47) is sclerosed.

Receptacular bracts of *Stomatochaeta* follow much the same pattern, as is shown in the transection of a bract of *S. cylindrica*, figure 50. The epidermis and one to several hypodermal layers on both surfaces consist of thick-walled sclereids. Only a single bundle could be found along the length of the bract in species of *Stomatochaeta* examined.

Although none of the other genera of Guayana Mutisieae possesses receptacular bracts, the curious gochnatinean genus *Wunderlichia* does have numerous bristles on the receptacle (like some Cynareae), and the writer was interested in determining if these had similar structure to receptacular bracts of the two above genera. As the transection in figure 51 shows, this is not the case. A differentiation into an outer region of sclerenchyma and an inner core of thin-walled parenchyma does exist in the upper portion of the bract, but no vascular bundle is present. This, then, represents a very reduced structure compared to receptacular bracts of *Stenopadus* and *Stomatochaeta*.

The problem of whether such bristle-like bracts on receptacles of Cynareae (a tribe placed close to Mutisieae by most authors) are products of splitting up of receptacular bracts or have some other origin is discussed by Napp-Zinn (1956). He regards them as subdivided bracts in the subtribe Carlinae, although he believes that the remainder of Cynareae is in doubt. True vascular strands have been found in receptacular bracts of Carlinae, although only rudimentary strands, or none at all, have been observed in other Cynareae (Daniel 1890; Nissen 1907). Elsewhere in Compositae, vascularized receptacular bracts have been reported only in Heliantheae (Napp-Zinn; Carlquist 1957d) and Anthemideae (Napp-Zinn), no previous studies on these structures in Mutisieae having been made.

Comparing bracts of both involucre and receptacle in Mutisieae to data of previous work, such as that of Daniel and Napp-Zinn, who dealt exclusively with other tribes, it is interesting to find that Mutisieae are far more richly provided with sclerenchyma in these structures. Moreover, the sclerenchyma figured by Napp-Zinn in other tribes appears to be at most thin-walled, and none of the sclereids with occluded lumina such as possessed by Mutisieae have been reported in other tribes. Where sclerenchyma occurs in other Compositae, it appears to have a distribution rather different from that of the Mutisieae considered. For example, in *Carduus nutans* (Daniel), sclerenchyma is on the abaxial face of the bract, whereas it is found most predominantly on the adaxial side in Mutisieae. In Heliantheae subtribe Verbesininae, strands of thin-wall fibers may be present (Napp-Zinn). Although fibrous bundle sheaths are not present in bracts of the helianthoid *Fitchia* (Carlquist 1957d), sclerification of the inner face of the bract and development of diffuse sclereids are not unlike what is found in certain Mutiseae, providing the closest parallel available from other Compositae.

SUMMARY

The data of this study represent several new anatomical records for Mutisieae (laticifers, vascularized receptacular bracts) as well as providing new descriptions of the anatomy of genera in the tribe. The facts developed in each category —stem, node, leaf, and involucre—definitely support the distinctness of the genera recognized by Maguire et al. (1957). Leaf anatomy, for example, could be used for the identification of most of these genera. In many instances, excellent specific characters are provided, e.g., characters of leaf anatomy in *Stenopadus*, *Stomatochaeta*, and *Duidaea*. Because of the seemingly greater variation in vegetative and involucral anatomy than that found in flower and pollen structure (Carlquist 1957d), many of the characters developed in this study tend to be of greater importance at the specific level.

In regard to broader relationships, structural details confirm the close relationship of *Stenopadus* with *Stomatochaeta* and *Chimantaea*, as well as the similar affinities of *Achnopogon*, *Duidaea*, and *Neblinaea* with *Gongylolepis*. In particular, the presence and distribution of sclerenchyma in stems and involucral bracts as well as the presence or absence of laticiferous cells are significant in uniting the genera within each group, as well as in differentiating the two groups from each other.

The presence of laticiferous cells in *Quelchia* is rather curious, considering that these are characteristic of *Gongylolepis* and its allies (Gerberinae) rather than the subtribe to which *Quelchia* is assigned, Gochnatinae, and it may be closer to Gerberinae than other genera of Gochnatinae. The characters of *Glossarion* show that it is obviously related to the remaining genera of Guayana Mutisieae, but not to any particular one of them. Its differentiation appears to have been separate from either the *Stenopadus* or the *Gongylolepis* lines, a conclusion also reached by Maguire (1956) on the basis of his studies.

Reference is made in this study to other genera of Gochnatinae—*Anastraphia, Hesperomannia, Stifftia,* and *Wunderlichia*—in an attempt to show the relative uniformity of the Guayana group and also to find similar characters in non-Guayana genera. Although *Stifftia* seems advanced in its involucral bract anatomy, its leaves are unspecialized. The sum of its characters suggests that it belongs among Gochnatinae near *Stenopadus*. The wood of *Stifftia* (Carlquist 1957b) is quite similar to that of *Hesperomannia,* which has leaf anatomy like that of *Stifftia*. In characters of involucral bracts and the non-curling habit of corolla lobes, *Hesperomannia* and *Anastraphia* agree. *Anastraphia,* however, has specialized leaf anatomy. The stem anatomy of *Hesperomannia* is much like that of *Stenopadus*. *Hesperomannia,* then, is exemplary of the complex relationships within this group of primitive Gochnatinae. Likewise, *Wunderlichia* has retained a primitive floral venation while becoming specialized in its advanced wood structure (Carlquist 1957b) and *Chimantaea*-like stem anatomy. Such instances as these suggest the common origin of these genera, followed by independent changes in various anatomical and morphological characters.

The significance of certain anatomical characters is not at present clear. For example, although trilacunar nodes are considered primitive in most instances (Sinnott 1914), the genera *Stenopadus* and *Gongylolepis* have multilacunar nodes, as do Heliantheae which are best regarded as primitive (Carlquist 1957d). The excessive sclerenchyma present in mutisioids studied here seems characteristic of the tribe, except for herbaceous genera, although it is difficult to designate it as primitive or advanced. The distribution of secretory canals and laticiferous cells in Mutisieae is curious, and further knowledge of the distribution of these within the family is required before we can be sure that the frequently accepted idea that secretory canals are primitive and laticifers advanced is of general application in the family. The possibility remains that some Compositae never acquired secretory canals, so that in Guayana Mutisieae we would be witnessing an early stage in their formation, as may be the case with laticifers in the Guayana Gerberinae.

Literature Cited

Betts, M. W. 1920. Notes from Canterbury College Mountain Biological Station, Cass. No. 7. The rosette plants. Part I. Trans. N. Z. Inst. **52**: 253–275.

Cabrera, A. 1951. Notas sobre compuestas de la America Austral. Darwiniana **9**: 363–386.

Carlquist, A. 1957a. Anatomy of Guayana Mutisieae. Mem. N. Y. Bot. Gard. **9**: 441–476.

————. 1957b. Wood anatomy of Mutisieae (Compositae). Trop. Woods **106**: 29–45.

————. 1957c. Systematic anatomy of *Hesperomannia.* Pacif. Sci. 11: 207–215.

————. 1957d. The genus *Fitchia* (Compositae). Univ. Calif. Publ. Bot. **29**: 1–44.

Col, M. S. 1904. Sur l'appareil sécréteur interne des composées. Jour. de Bot. **18**: 153–175.

Cronquist, A. 1955. Phylogeny and taxonomy of the Compositae. Am. Midl. Nat. **53**: 478–511.

Daniel, L. 1890. Recherches anatomiques et physiologiques sur les bractées de l'involucre des composées. Thesis, Paris. G. Masson.

Douliot, H. 1889. Recherches sur la periderme. Ann. Sci. Nat. Bot. VII. **10**: 325–395.

Grimm, A. H. 1904. Beiträge zur vergleichende Anatomie der Compositenblätter. Thesis, Kiel. H. Fiencke.

Hoffman, O. 1890. Compositae. *In:* Engler & Prantl: Die natürlichen Pflanzenfamilien **4**(5): 87–402.

Johansen, D. A. 1940. Plant microtechnique. i-xii, 1–523.

Maguire, Bassett. 1956. Distribution, endemicity and evolution patterns among Compositae of the Guayana Highland of Venezuela. Proc. Am. Philos. Soc. **100**: 467–475.

Maguire, Bassett, Cowan, R. S., & Wurdack, J. J. 1953. The botany of the Guayana Highland. Mem. N. Y. Bot. Gard. **8**: 87–160.

Maguire, Bassett & Wurdack, J. J. 1957. Botany of the Guayana Highland—Part. II. Mem. N. Y. Bot. Gard. **9**: 235–392.

Maguire, Bassett, Steyermark, J. A. & Wurdack, J. J. 1957. The botany of the Chimantá Massif—I. Gran Sabana, Venezuela. Mem. N. Y. Bot. Gard. **9**: 393–440.

Metcalfe, C. R. and L. Chalk. 1950. Anatomy of the Dicotyledons.

Napp-Zinn, K. 1956. Beiträge zur Anatomie und Morphologie der Involucral- und Spreublätter der Compositen. Botanische Studien **6**: 1–116.

Nissen, J. 1907. Untersuchungen über den Blütenboden der Kompositen. Thesis, Kiel.

Quentin, J. 1911. Contribution à l'étude anatomique des espèces du genre *Baocharis.* Thesis, Paris.

Shields, Lora M. 1951. Leaf xeromorphy in dicotyledon species from a gypsum sand deposit. Am. Jour. Bot. **38**: 175–190.

Sinnott, E .W. 1914. Investigations on the phylogeny of angiosperms. I. The anatomy of the node as an aid in the classification of angiosperms. Am. Jour. Bot. **1**: 303–322.

Solereder, H. 1908. Systematic anatomy of the dicotyledons (trans. by L. A. Boodle and F. E. Fritsch).

Van Tieghem, P. 1872. Mémoire sur les canaux sécréteurs des plantes. Ann. Sci. Nat. Bot. V. **16**: 96–201.

Vuillemin, P. 1884. De la valeur des caractères anatomiques au point de vue de la classification des végétaux. Tige des composées.

MEMOIRS

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME 10, NUMBER 2

The Botany of the Guayana Highland—Part IV
BASSETT MAGUIRE AND JOHN J. WURDACK AND COLLABORATORS 1

The Morphology and Relationships of Diomma, Gen. Inc. Sed.
WILLIAM L. STERN AND GEORGE K. BRIZICKY 38

Taxonomic Relationships of Diomma Engler ex Harms
RICHARD S. COWAN AND GEORGE K. BRIZICKY 58

Anatomy of Guayana Xyridaceae: Abolboda, Orectanthe, and Achlyphila ——— SHERWIN CARLQUIST 65

Issued 30 April 1960

The Memoirs of The New York Botanical Garden are issued at irregular intervals in parts of various sizes. Approximately 500 pages will complete a volume. The subscription price of volume 10 is $10.00. Number 1 may be purchased separately for $3.00. Authors of papers may obtain separate copies of their contributions, printed at the same time as the issue, at cost price.

For further information address the editor:

H. W. Rickett
The New York Botanical Garden
New York 58, N. Y.

APR. 1960 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN 10(2):1–37

THE BOTANY OF THE GUAYANA HIGHLAND—PART IV

Bassett Maguire and John J. Wurdack*
and Collaborators

INTRODUCTION

The return visit to Cerro de la Neblina in southwesternmost Venezuela, announced in the introduction of Part III of our Guayana Highland reports, was indeed accomplished as there indicated. We returned to New York on 11 February 1958, having completed a six-month exploration of Neblina and waterways of the Río Orinoco–Río Casiquiare–Río Negro drainages. During the succeeding March, Venezuela was again visited, so that we might make further aerial survey of the mountain and the region around it.

Plant collections obtained on these trips were:

Alto Río Orinoco, Río Atabapo, Río Guainía, Río Casiquiare, and Río Pacimoni, Terr. Amazonas, Venezuela, 11 September–15 October 1957; Bassett Maguire, John J. Wurdack and Wm. M. Keith, Jr., Nos. 41428-41923.

Río Pacimoni-Yatua, Cerro de la Neblina, and Alto Río Orinoco, Terr. Amazonas, Venezuela, 16 October 1957–18 January 1958; Bassett Maguire, John J. Wurdack and Celia K. Maguire, Nos. 41924-42655.

We present herewith in Part IV of our report on "The Botany of the Guayana Highland" contributions as follows: *Musci* by Edwin B. Bartram; *Xyridaceae*, *Marantaceae*, *Linaceae*, and *Ochnaceae* by Bassett Maguire and John J. Wurdack; *Bromeliaceae* by Lyman B. Smith; *Annonaceae* by Robert E. Fries; *Rutaceae* by Richard S. Cowan (with the collaboration of G. K. Brizicky on *Spathelia*); *Guttiferae* by Bassett Maguire; *Aquifoliaceae* and *Melastomataceae* by John J. Wurdack; and *Acanthaceae* by Emery C. Leonard. Dr. Thomas Morley collaborated in the study of the genus *Mouriri*. In an accompanying article Dr. Sherwin Carlquist offers his interesting morphological study, "Anatomy of Guayana *Xyridaceae*." Dr W. L. Stern and Dr G. K. Brizicky contribute an article on the anatomy of *Diomma* in the *Rutaceae*.

---

* Present address: Department of Botany, Smithsonian Institution, Washington 25, D. C.

MUSCI[1]

SPHAGNACEAE

Sphagnum magellanicum Brid.

VENEZUELA: Bolívar: Chimantá Massif, swampy savanna along west branch of headwaters of Río Tirica above Upper Falls, alt. 2000 m, *Steyermark & Wurdack 900.* Rapids of Río Apácara over igneous rock ¼ mile downstream from mouth of Río Abácapa, western side of Apácara-tepuí, alt. 415 m, *Steyermark 74664, 74697.* Vicinity of Techine-Merú, along Río Apárurén, between mouth of Río Apárurén and Kon-quén, elev. 470 m, *Steyermark 76059.*

Sphagnum erythrocalyx Hpe.

VENEZUELA: Bolívar: Chimantá Massif, east-central portion of summit of Apácara-tepuí alt. 2450–2500 m, *Steyermark 75927.* Amazonas: Cerro Sipapo (Paráque), on hummocks, savanna Caño Negro, alt. 1500 m, *Maguire & Politi 27722.*

Dr. Andrews kindly determined this collection and remarks that the species is well represented in Brazil from which country the type came.

Sphagnum portoricense Hpe.

VENEZUELA: Bolívar: Chimantá Massif, vicinity of Summit Camp, alt. 1925 m, *Steyermark & Wurdack 381.*

The identification of this species has been confirmed by Dr. Andrews. It has been recorded from British Guiana, I believe, but not from Venezuela.

Sphagnum strictum Sull.

VENEZUELA: Bolívar: Chimantá Massif, scrub forest near Summit Camp, alt. 1295 m, *Steyermark & Wurdack 373.*

Dr. Andrews kindly informs me that there are only two known localities for this species in South America: Venezuela and Ecuador. The Venezuelan material was collected by Steyermark from Bolívar but not from the locality given above. The Ecuador record was in the Warnstorf Herbarium in Berlin and was destroyed in the last war.

Sphagnum gracilescens Hpe.

VENEZUELA: Bolívar: Chimantá Massif, along southwest-facing sandstone bluffs of Chimantá-tepuí (Torono-tepuí) near southern corner, alt. 1700 m, *Steyermark 75486.*

Sphagnum subsecundum Nees.

VENEZUELA: Bolívar: Chimantá Massif, face and damp bluffs of upper falls of Caño Mojado east of north escarpment, alt. 1910–1970 m, *Steyermark & Wurdack 974.* Forested slopes between Camps 3 and 4, southwestern part of Apácara-tepuí, alt. 1210–1600 m, *Steyermark 75052.*

Sphagnum meridense (Hpe.) C. M.

VENEZUELA: Bolívar: Chimantá Massif, vicinity of Summit Camp, elev. 1925 m, *Steyermark & Wurdack 382.* Moist forest along quebrada below waterfall, vicinity of Camp 4, southwestern edge of Apácara-tepuí, alt. 1800–2000 m, *Steyermark 74979.*

Sphagnum oxyphyllum Warnst.

VENEZUELA: Cerro Sipapo (Paráque), on hummocks, savanna Caño Negro, *Maguire & Politi 27741;* cliffs North Savanna, alt. 1400 m, *Maguire & Politi 27771;* cliffs overlooking upper Caño Negro, alt. 1500 m, *Maguire & Politi 28202, 28203.*

These collections indicate a generous distribution in this particular area.

---

[1] By Edwin B. Bartram.

DICRANACEAE

Campylopus flexuosus (Hedw.) Brid.

VENEZUELA: Bolívar: Chimantá Massif, slope forest above Río Tirica, alt. 1365–1670 m, *Steyermark & Wurdack 1259.*

Campylopus cubensis Sull.

VENEZUELA: Bolívar: Chimantá Massif, moist forest along quebrada below waterfall, vicinity of Camp 4, southwestern edge of Apácara-tepuí, alt. 1800–2000 m, *Steyermark 74980.*

I have referred this collection here in a broad sense and not without considerable hesitation. The longer leaf cells, especially above where they are linear rather than oval, suggest a distinct concept in comparison with the West Indian plants as Mr. Howard Crum has suggested. Muller has described three related species from Venezuela, but no critical comparison is possible from the descriptions and the originals may have been destroyed.

Campylopus richardi Brid.

VENEZUELA: Bolívar: Chimantá Massif, scrub forest near summit camp, alt. 1925 m, *Steyermark & Wurdack 315.*

Campylopus prealtus (C. M.) Par.

VENEZUELA: Bolívar: Savannas, vicinity Mission Santa Teresita de Kavanayén, alt. 1500 m, *Maguire & Politi 28003.*

This collection helps to consolidate the known range of the species which occurs in Puerto Rico, British Honduras, Venezuela and Brazil.

Dicranodontium denudatum (Brid.) E. G. Britt.

VENEZUELA: Bolívar: Chimantá Massif, moist, mossy forest, vicinity of Camp 4, southwestern edge of Apácara-tepuí, alt. 1600–1800 m, *Steyermark 75037.*

Dicranoloma steyermarkii Bartr., sp. nov.

Sat robustum, caespitibus laxis, fuscescentibus, haud nitidis. Caulis usque ad 6 cm altus, parce ramulosus. Folia conferta, sicca patentia, arcte flexuosa, humida secunda, 10–12 mm longa, e basi concava, ovata, 1.5 mm lata, abrupte longe setacea; marginibus superne serratis; costa tenui, breviter excurrenti; cellulis superioribus linearibus, incrassatis, porosis, inferioribus longioribus, margines versus angustioribus, alaribus subquadratis, fere ad costa productis. Folia perichaetialia intima erecta, longe setacea, fere ad thecam producta. Seta circa 2 cm longa, tenuis; theca (immatura) inclinata, cylindrica, deoperculata 2 mm longa; operculo rostrato, 2 mm longa. Caetera ignota.

VENEZUELA: Bolívar: Chimantá Massif, vicinity of Camp 4, Apácara-tepuí, alt. 1800–2000 m, on branch, *Steyermark 74980b* (type).

The long perichaetium with the tips of the inner leaves reaching nearly to the base of the capsule is a distinctive feature.

LEUCOBRYACEAE

Octoblepharum erectifolium Mitt.

VENEZUELA: Bolívar: Chimantá Massif, scrub forest near Summit Camp, elev. 1925 m, in rock crevice, *Steyermark & Wurdack 310.*

Octoblepharum cylindricum Schp.

VENEZUELA: Bolívar: Chimantá Massif, summit, at edge of escarpment in and among *zanjones,* alt. 2165–2180 m, *Steyermark & Wurdack 674.*

Octoblepharum mittenii Jaeg.

VENEZUELA: Bolívar: Chimantá Massif, forested slopes, along trail between Camp 2 and 3, northwestern part of Abácapa-tepui alt. 750–1100 m, *Steyermark 74828.*

Octoblepharum tatei (Williams) Bartr., comb. nov.

Carinafolium tatei Williams, Bull. Torrey Club **58**: 502. 1931.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, in upper Cañon Grande basin, elev. 1900 m, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42358.* Bolívar: Chimantá Massif, vicinty of Camp 4, Apácara-tepuí, alt. 1800–2000 m, *Steyermark 74980a.*

The sporophyte characters as shown in no. 42358 are as follows: setae slender, reddish, 15–20 mm long; capsule erect, cylindrical, the urn 2 mm long; peristome teeth 16, pale, hyaline, faintly papillose, apparently in 8 pairs (the capsules all old and deoperculate with only vestiges of the peristome remaining).

As the sporophyte shows no distinctive characters, the dorsal keel of the costa is the only feature that separates this species from *Octoblepharum.* Under the circumstances it seems more practical to include the species in *Octoblepharum* where it obviously belongs.

Leucobryum martianum (Hornsch.) Hpe.

VENEZUELA: Bolívar: Chimantá Massif, southwest slope forest and savannas, Ptari-tepuí elev. 1500-2000 m, *Maguire & Wurdack 33982;* densely forested slopes between upper reaches of Río Tirica (left-hand fork) and Riscobel Ledema Camp, southeast portion of Apácara-tepuí, alt. 1700–1850 m, *Steyermark 75964;* moist mossy forest, vicinity of Camp 4, southwestern edge of Apácara-tepuį, alt. 1600–1800 m, *Steyermark 75027;* slopes and talus forest, Sarvén-tepuí, alt. 1200 m, *Wurdack 34358.* Amazonas: Cerro Sipapo (Paráque), moist woodland, Danta Falls, ''Tapir Falls,'' alt. 1500 m, *Maguire & Politi 27333.*

Numbers 75028, 27333, and 34358 represent the purplish-tinged form previously collected from the summit of Cerro Duida.[2]

Leucobryum crispum C. M.

One of the common mosses of the area, represented by seven collections at altitudes of from 415 to 2000 m, on fallen logs and boulders.

VENEZUELA: Cerro Sipapo (Paráque), mixed woodland base escarpment, upper camp savanna, alt. 1500 m, *Maguire & Politi 27669;* North Savanna, alt. 1400 m, *Maguire & Politi 27768A;* with hepatics.

Leucobryum albicans (Schwaegr.) Lindb.

VENEZUELA: Bolívar: Chimantá Massif, forested slopes below summit of western escarpment, Torono-tepuí, alt. 1970 m, *Steyermark & Wurdack 707;* savannas, vicinity of Mission Santa Teresita de Kavanayén, alt. 1300 m, *Maguire & Wurdack 33769;* southwest slope forest and savannas, Ptari-tepuí, alt. 1500–2000 m, *Maguire & Wurdack 33971;* moist mossy forest, vicinity of Camp 4, southwestern edge of Apácara-tepuí, alt. 1600–1800 m, *Steyermark 75038.* Amazonas: Cerro Sipapo (Paráque), cliffs North Savanna, alt. 1400 m., *Maguire & Politi 27772.*

Leucobryum albidum (Brid.) Lindb.

VENEZUELA: Bolívar: Chimantá Massif, on large rock bordering savanna above summit camp, alt. 1940 m, *Steyermark & Wurdack 415.*

New to South America as well as to Venezuela.

Leucobryum brevifolium Bartr., sp. nov.

Caespitosum, caespitibus densis, infra fuscescentibus. Caulis ad 8 cm altus, dichotome ramosus. Folia erecto-patentia, conferta, ovato-lanceolata, concava,

---

[2] Fieldiana Bot. **28**^{4}: 702. 1957.

late obtusa, 3–4 mm longa, 1 mm lata; marginibus inferne erectis, superne involutis, in sectione transversali leucocystae ubique biseriatae, limbo basilari (lamina vera) e seriebus 4–6 lato. Caetera ignota.

VENEZUELA: Bolívar: Chimantá Massif, *Bonnetia* swale along creek just east of west branch of headwaters of Río Tirica, terrestrial, alt. 2120 m, 11 Feb. 1955, *Steyermark & Wurdack 726* (type); elfin forest formation on plateau of southeast-facing upper shoulder of Apácara-tepuí, terrestrial, alt. 2000 m, *Steyermark 75719* (paratype).

The short, ovate-lanceolate leaves tapering gradually to the rounded, cucullate apex with the leucocysts in two layers throughout the leaf make this a unique species comparable with nothing I am familiar with. Cross sections from the upper part of the leaf show the chlorocysts much nearer the dorsal side while below they are nearly central.

CALYMPERACEAE

Syrrhopodon tenuifolius (Sull.) Mitt.

VENEZUELA: Bolívar: Chimantá Massif, south-facing forested slopes above valley of South Caño on summit, alt. 1955–2090 m, *Steyermark & Wurdack 1119.*

New to Venezuela.

Syrrhopodon gaudichaudii Mont.

VENEZUELA: Bolívar: Chimantá Massif, rocky slopes of *zanjon* bordering upper falls of Río Tirica above Summit Camp, alt. 1950 m, *Steyermark & Wurdack 615.*

Syrrhopodon rigidus Hook. & Grev.

VENEZUELA: Bolívar: Slopes and talus forest, Sarvén-tepuí, on liana stem in rain forest near Camp 9, alt. 1200 m, *Wurdack 34357.*

New to Venezuela.

POTTIACEAE

Trichostomum duidense Bartr.

VENEZUELA: Bolívar: Chimantá Massif, on large rock bordering savanna above Summit Camp, alt. 1940 m, *Steyermark & Wurdack 426;* thickets bordering savanna below upper falls of Río Tirica above Summit Camp, *Steyermark & Wurdack 616;* slope forest above Río Tirica, alt. 1365–1670 m, *Steyermark & Wurdack 1241;* slopes and talus forest, Sarvén-tepuí between Camps 3 and 4, alt. 1400 m, *Wurdack 34079.*

BRYACEAE

Bryum curvifolium Bartr., sp. nov.

Sat robustum, caespitosum, caespitibus fuscescentibus, vix nitidis. Caulis 2–3 cm altus, regulariter foliosus, inferne rufo-tomentosus. Folia sicca erecta, leniter curvata, humida erecto-patentia, incurva, asymmetrica, supra medium curvata, 2.5 mm longa, 0.5 mm lata, oblongo-lanceolata, breviter acuminata; marginibus inferne integris, recurvis, superne planis, arcte serratis; costa in aristam brevem, serratam excurrenti; cellulis superioribus anguste rhomboideis, marginalibus angustioribus, limbum indistinctum 2–3-seriatim formantibus, basilaribus brevioribus. Seta tenuis, 3 cm longa. Caetera ignota.

VENEZUELA: Bolívar: Chimantá Massif, dense wet elfin forest formation of recumbent branches just below southeast-facing upper shoulder of Apácara-tepuí (between Riscobel Ledema Camp and plateau), alt. 1900–1950 m, *Steyermark 75705* (type).

The asymmetrical leaves curved to one side above the middle are unique and comparable with nothing else I am familiar with.

Rhodobryum grandifolium (Tayl.) Par.

VENEZUELA: Bolívar: Chimantá Massif, between Bluff Camp and low promontory north of Bluff Camp, along west-facing portion of Chimantá-tepuí (Torono-tepuí), alt. 1600–1700 m, *Steyermark 75641.*

MNIACEAE

Mnium longirostrum Brid.

VENEZUELA: Bolívar: Chimantá Massif, southeast-facing forested slopes below escarpment, alt. 1880–1955 m, *Steyermark & Wurdack 1146.*

RHIZOGONIACEAE

Rhizogonium spiniforme (Hedw.) Bruch.

VENEZUELA: Bolívar: Chimantá Massif, wet mossy forest with sandstone boulders, between Camp 3 and main line of sandstone bluffs, northwestern part of Abácapa-tepuí, alt. 1210–1600 m, *Steyermark 75084;* between Bluff Camp and low promontory north of Bluff Camp, alt. 1600–1700 m, *Steyermark 75679;* densely forested slopes between upper reaches of Río Tirica, southeast portion of Apácara-tepuí, alt. 1700–1850 m, *Steyermark 75982.*

ORTHOTRICHACEAE

Zygodon reinwardtii (Hornsch.) Al. Br.

VENEZUELA: Bolívar: Chimantá Massif, vicinity of upper falls of Río Tirica, above Summit Camp, alt. 1940–2090 m, *Steyermark & Wurdack 619, 895a.*

Groutiella apiculata (Hook.) Crum & Steere

VENEZUELA: Bolívar: Chimantá Massif, between Bluff Camp and low promontory north of Bluff Camp, along west-facing portion of Chimantá-tepuí (Torono-tepuí), alt. 1600–1700 m, *Steyermark 75680.*

Macromitrium ulophyllum Mitt.

VENEZUELA: Bolívar: Chimantá Massif, six collections from trees and shrubs at altitudes of 2000–2200 m, indicating a broad distribution in this limited area. Amazonas: Cerro Sipapo (Paráque), on shrubs near summitt of Peak I, alt. 2000 m, *Maguire & Politi 28149.*

Macromitrium podocarpi C. M.

VENEZUELA: Bolívar: Chimantá Massif, elfin forest formation on plateau of southeast-facing upper shoulder of Apácara-tepuí, alt. 2000 m, *Steyermark 75745.*

Macromitrium dussii Broth.

VENEZUELA: Bolívar: Chimantá Massif, elfin forest formation on plateau of southeast-facing shoulder of Apácara-tepuí, alt. 2000 m, *Steyermark 75744.*

The broad, acutely pointed leaf apex of this species is in bold contrast to the slenderly acuminate leaf tip of *M. dubium.* New to Venezuela.

Schlotheimia trichomitria Schwaegr.

VENEZUELA: Bolívar: Chimantá Massif, scrub forest near Summit Camp, alt. 1925 m, *Steyermark & Wurdack 278;* forested slope below summit of western escarpment, Torono-tepuí, alt. 1970 m, *Steyermark & Wurdack 708;* open dwarf forest, north-facing slopes on summit above valley of Caño Mojado, alt. 2030–2150 m, *Steyermark & Wurdack 1033.*

SPLACHNACEAE

Tetraplodon mnioides (Hedw.) Bry. Eur.

VENEZUELA: Cerro Sipapo (Paráque), on rocks in southeast summit, alt. 1800 m, *Maguire & Politi 27808.*

This unusual record represents the first occurrence of the species in northern South America as far as I am aware. It might be construed as an example of the southward push of vegetation during the postglacial ages.

Brachymenium (*Peromnium*) **sipapoense** Bartr., sp. nov.

Caespitosum, caespitibus densis, rufescentibus, opacis. Caulis usque ad 3 cm altus, parce ramosus, inferne dense rufotomentosus. Folia sicca erecta, leniter flexuosa, humida erecto-patentia, oblongo-lanceolata, acuminata, 3–3.5 mm longa, 0.6 mm lata; marginibus planis, inferne integris, prope apicem spinoso-serratis; costa excurrenti; cellulis superioribus linearibus, 75 μ longis, 12 μ latis, margines versus angustioribus, 4–5-seriatis limbum indistinctum formantibus, basilaribus brevioribus. Seta 2 cm longa rubra; theca erecta, oblongo-cylindrica, deoperculata 5 mm longa. Caetera ignota.

VENEZUELA: Cerro Sipapo (Paráque), caño from West Peak drainage, alt. 1230 m, *Maguire & Politi 27811*, 20 Dec 1949 (type).

Possibly near *B. radiculosum* (Schwaegr.) Par., but with more elongate upper leaf cells and spinose-serrate margins near the apex. The capsules are too old to show the peristome characters.

RHACOPILACEAE

Rhacopilum tomentosum (Hedw.) Brid.

VENEZUELA: Bolívar: Chimantá Massif, between Bluff Camp and low promontory north of Bluff Camp, along west-facing portion of Chimantá-tepuí (Torono-tepuí), alt. 1600–1700 m, *Steyermark 75640*.

HEDWIGIACEAE

Rhacocarpus humboldtii (Hook.) Lindb.

VENEZUELA: Bolívar: Chimantá Massif, along Río Tirica between Middle Falls and Summit Camp, alt. 1856 m, *Steyermark & Wurdack 252, 263, 265*; vicinity of Upper Falls of Río Tirica above Summit Camp, alt. 1940–1950 m, *Steyermark & Wurdack 623*.

PTEROBRYACEAE

Orthostichopsis tetragona (Hedw.) Broth.

VENEZUELA: Bolívar: Chimantá Massif, rich rain forest on lower northwestern slopes of Abácapa-tepuí, vicinity of Camp 1 along Río Abácapa, alt. 420 m, *Steyermark 74737*.

METEORIACEAE

Squamidium leucotrichum (Tayl.) Broth.

VENEZUELA: Bolívar: Chimantá Massif, scrub forest near Summit Camp, alt. 1925 m, *Steyermark & Wurdack 294*; rich forested steep west-facing slopes below Camp 3, northwestern part of Abácapa-tepuí, alt. 1110–1200 m, *Steyermark 75129*.

Pilotrichella flexilis (Hedw.) Jaeg.

VENEZUELA: Bolívar: Chimantá Massif, swampy savanna in depression along tributary valley of east branch of headwaters of Río Tirica, alt. 2120 m, *Steyermark & Wurdack 844*.

NECKERACEAE

Porotrichum longirostre (Hook.) Mitt.

VENEZUELA: Bolívar: Chimantá Massif, moist mossy forest, vicinity of Camp 4, southwestern edge of Apácara-tepuí, alt. 1600–1800 m, *Steyermark 75022*.

PILOTRICHACEAE

Pilotrichum bipinnatum (Schwaegr.) Brid.

VENEZUELA: Bolívar: Chimantá Massif, southwestern-facing forested slopes of Chimantá-tepuí (Torono-tepuí) between base camp and steep slopes above valley of Río Tirica, alt. 1000–1400 m, *Steyermark 75370*.

HOOKERIACEAE

Daltonia tenuifolia Mitt.

VENEZUELA: Bolívar: Chimantá Massif, along west branch of headwaters of Río Tirica above Upper Falls, alt. 2090 m, *Steyermark & Wurdack 895.* New to Venezuela.

Previously known from Costa Rica, Ecuador, and Bolivia.

Adelothecium bogotense (Hpe.) Mitt.

VENEZUELA: Bolívar: Chimantá Massif, forested slopes below western escarpment of Torono-tepuí, alt. 1970 m, *Steyermark & Wurdack 706.*

Cyclodictyon albicans (Hedw.) Broth.

VENEZUELA: Bolívar: Chimantá Massif, riverine forest near Piedra Cucuy, alt. 100 m, *Maguire & Wurdack 34947.*

Callicostella depressa (Hedw.) Jaeg.

VENEZUELA: Amazonas: On fallen logs along uppermost Río Yatua, alt. 100–140 m, 23 Oct 1957, *Maguire, Wurdack & Maguire 41940.*

Leskeodon parvifolius Bartr., sp. nov.

Caulis 1–1.5 mm longus, dense foliosus, prostratus. Folia parva, sicca crispatula, humida late patentia, 1–1.2 mm longa, 0.6 mm lata, late ovata vel obovata, piliformiter aristata, arista ad 0.3 mm longa; marginibus parce vel haud undulatis, integris, limbatis, limbo angusto, 3-seriatim; costa tenui, ad medium folii producta; cellulis hexagonis, laxis, diam. 25–28 μ. Caetera ignota.

VENEZUELA: Bolívar: Chimantá Massif, between Summit Camp and base of escarpment on damp log, alt. 1880–1970 m, 27 Feb 1955, *Steyermark & Wurdack 1184a* (type).

This species may be compared with *L. pungens* Mitt. from which it differs in the flat, scarcely undulate leaf margins and the much larger leaf cells.

Actinodontium portoricense Crum & Steere.

VENEZUELA: Bolívar: Chimantá Massif, forest along Río Tirica, Torono-tepuí, on log in dry stream bed, alt. 1365–1670 m, *Steyermark & Wurdack 1260a.*

These plants agree closely with those from the type collection of *A. portoricense* in the larger leaves and strongly recurved margins. The range extension south to southern Venezuela follows the typical pattern of many of the West Indian species recorded here.

Hypnella cymbifolia (Hpe.) Jaeg.

VENEZUELA: Bolívar: Chimantá Massif, *Clusia* forest on slopes of Middle Falls of Río Tirica below Summit Camp, alt. 1760–1880 m, *Steyermark & Wurdack 1218;* slope forest of Tirepón-tepuí, alt. 1200–1250 m, *Wurdack 34056, 34365.*

Neohypnella chrysophyllopodia (C. M.) Bartr.

VENEZUELA: Bolívar: Chimantá Massif, trail between Camps 3 and 4, vicinity of stream between northwestern part of Abácapa-tepuí and Apácara-tepuí, alt. 1200–1600 m, *Steyermark 75149.*

Hookeriopsis falcata (Hook.) Jaeg.

VENEZUELA: Bolívar: Chimantá Massif, five collections showing a general distribution at altitudes of 1600–2050 m, on logs.

Hookeriopsis parkeriana (Hook.) Jaeg.

VENEZUELA: Bolívar: Chimantá Massif, rich forest on lower northwestern slopes of Abácapa-tepuí, vicinity of Camp 1 along Río Abácapa, alt. 420 m, *Steyermark 74732;* rich forest, vicinity of base camp near Río Tirica, lower southwestern slopes of Chimantá-tepuí (Torono-tepuí), alt. 1000 m, *Steyermark 75577.*

Hookeriopsis crispa (C. M.) Jaeg.

VENEZUELA: Bolívar: Chimantá Massif, northwest-facing slopes between Summit Camp and base of escarpment, alt. 1880–1970 m, *Steyermark & Wurdack 1184;* talus forest between Camp 5 and base of lower escarpment, alt. 1750–2000 m, *Wurdack 34101.*

Hookeriopsis (Omaliadelphus) maguirei Bartr. sp. nov.

Dioica, sat robusta, lutescenti-viridis, nitida. Caulis ad 8 cm longus, irregulariter ramosus, dense foliosus. Folia sicca laxe imbricata, leniter contorta, haud undulata, humida erecto-patentia, oblongo-ovata, valde concava, rotundato-obtusa, ad 1.5 mm longa, 0.6 mm lata; marginibus erectis, integris, prope apicem inflexis; costa bina, fere ad apicem producta, dorso superne laevissima; cellulis linearibus, apicem versus brevioribus, ovalibus, inferne laxioribus, laevissimis. Seta 3–3.5 cm longa, sat tenuis, rubra, laevissima; theca horizontali, e collo brevi ovali, deoperculata 1–1.2 mm longa, sub ore valde constricta.

VENEZUELA: Amazonas: Cerro de la Neblina, locally frequent on logs and tree trunks in talus forest between Camps 3 and 4, alt. 700–1100 m, December 28, 1957, *Maguire, Wurdack & Maguire 42543a* (type).

Sharply distinct in the concave, obtusely rounded, smooth leaves.

Lepidopilum diaphanum (Hedw.) Mitt.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, on logs and tree trunks in talus forest between Camps 3 and 4, alt. 700–1100 m, 28 Dec 1957, *Maguire, Wurdack & Maguire 42543b;* mixed with *Thudium urceolatum* Lor.

Only a scrap but an interesting record as the species was previously known only from Jamaica and Guatemala.

LEUCOMIACEAE

Leucomium attenuatum Mitt.

VENEZUELA: Bolívar: Chimantá Massif, trail between Camps 3 and 4, vicinity of stream between northwestern part of Abácapa-tepuí and Apácara-tepuí, alt. 1200–1600 m, *Steyermark 75147;* densely forested slopes between upper reaches of Río Tirica and Riscobel Ledema Camp, southeast portion of Apácara-tepuí, alt. 1700–1850 m, *Steyermark 75964a.*

LESKEACEAE

Thuidium urceolatum Lor.

VENEZUELA: Amazonas: Cerro de la Neblina, on logs and tree trunks in talus forest between Camps 3 and 4, alt. 700–1100 m, *Maguire, Wurdack & Maguire 42543*, 28 Dec 1957. Bolívar: Chimantá Massif, on forested slopes between Camps 3 and 4, southwestern part of Apácara-tepuí, alt. 1210–1600 m, *Steyermark 75046;* between Bluff Camp and low promontory north of Bluff Camp, along west-facing portion of Chimantá-tepuí (Torono-tepuí), *Steyermark 75655.*

SEMATOPHYLLACEAE

Sematophyllum caespitosum (Hedw.) Mitt.

VENEZUELA: Bolívar: Chimantá Massif, slope forest along Río Tirica, *Steyermark & Wurdack 1260,* alt. 1365–1670 m.

Potamium vulpinum (Mont.) Mitt.

VENEZUELA: Bolívar: Hato la Vergareña, along Río Aro, 14 km below mouth of Caño Azul, alt. 390 m, *Wurdack & N. G. L. Guppy 230.*

Acroporium pungens (Hedw.) Broth.

VENEZUELA: Bolívar: Chimantá Massif, scrub forest near Summit Camp, alt. 1925 m, *Steyermark & Wurdack 319;* vicinity of Upper Falls of Río Tirica above Summit Camp, alt. 1940–1950 m, *Steyermark & Wurdack 609.*

Trichosteleum fluviale (Mitt.) Jaeg. ?

VENEZUELA: Amazonas: Ríos Pacimoni, Yatua, Casiquiare, alt. 100–140 m, on log along uppermost Río Yatua, *Maguire, Wurdack & Maguire 41939.*

Taxithelium planum (Brid.) Mitt.

VENEZUELA: Amazonas: Alto Río Orinoco, on tree branch along Río Padamo, alt. 150 m, 27 Mar 1953, *Maguire & Wurdack 34794.*

HYPNACEAE

Ectropothecium apiculatum (Hornsch.) Mitt.

VENEZUELA: Bolívar: Chimantá Massif, base of southwest-facing escarpment, alt. 1365 m, *Steyermark & Wurdack 1350.*

Mittenothamnium minusculifolium (C. M.) Card.

VENEZUELA: Bolívar: Chimantá Massif, densely forested slopes between upper reaches of Río Tirica (left-hand fork) and Riscobel Ledema Camp, southeast portion of Apácara-tepuí, alt. 1700-1850 m, *Steyermark 75960.*

POLYTRICHACEAE

Polytrichum juniperinum Hdw.

VENEZUELA: Bolívar: Savannas, vicinity Mission Santa Teresita de Kavanayén, alt. 1200 m, 18 Dec 1952, *Maguire & Wurdack 33809*; north-facing slope forest, Sororopán, alt. 1800 m, 17-18 Dec 1952, *Maguire & Wurdack 33970.*

Polytrichadelphus peruvianus Broth.

VENEZUELA: Bolívar: Chimantá Massif, scrub forest near Summit Camp, in large colonies bordering river bank swales, alt. 1925 m, *Steyermark & Wurdack 366.*

These plants differ from the Costa Rican representatives of *P. peruvianus* in several particulars but I believe they can be included in the specific concept without injustice. The stems up to 40 cm long and the less rigid habit may be the result of different growing conditions at a lower altitude, but the structure and shape of leaves are alike. If a subsequent examination of the type of *P. valenciae* (C. M.) Par. (*Catharinea valenciae* C. M.) shows no substantial differences, I suspect that Brotherus' name will have to be relegated to synonymy in favor of the earlier published epithet.

A complete set of the species listed above is in the herbarium of The New York Botanical Garden and a duplicate set in the writer's herbarium.

ANTHOPHYA

XYRIDACEAE

Even before earlier comments on relationships within the Xyridaceae had reached the printed page, we, already in the field, had collected specimens that brought a new generic name to the *Xyridaceae*. This new finding requires a reexamination of the familial integrity and generic composition of the *Xyridaceae*. Also, in the meantime Dr. Sherwin Carlquist has had opportunity to examine anatomically and morphologically freshly collected materials of the family. We have drawn freely from the discussions in his paper, which accompanies the present work.

In our earlier discussion[3] we had with some reservation held *Abolboda* and the newly segregated *Orectanthe*, together with the type genus *Xyris*, to constitute the *Xyridaceae*. The strongly marked massive (75–250 μ diam.), spheroidal, non-aperturate, spinose pollen grains of the first two seemed to give strong support to the position that they were familially inconsistent with *Xyris*, which has small (47–53 μ diam., long axis), aperturate, sulcate, spineless pollen grains. These rather profound palynological discrepancies had led Erdtman[4] to suggest that *Abolboda* (sensu lato) may be better referred to a monotypic family. Nakai[5], without presentation of argument, had earlier given the name *Abolbodaceae* valid status.

On our recent visit to Cerro de la Neblina in southwesternmost Amazonian Venezuela, we collected in dwarf scrub vegetation of the often cloud-drenched summit a yellow-flowered perennial monocotyledonous herb that we have called *Achlyphila*, the name suggested by its habitat. Despite its non-xyrid habit, we had concluded, because of similarity and identity of many features with those of the *Xyridaceae*, and because of its inadmissibility to other associated monocot families, that its affinities must lie with *Xyris*, *Abolboda*, and *Orectanthe*. Supplementary data offered by Dr. Carlquist's anatomical studies strengthen and support this conclusion; we now offer a restatement and redelineation of the *Xyridaceae*, and propose herein a new genus, *Achlyphila*, the fourth for the family.

Xyridaceae Lindley, Nat. Syst. ed 2. 388. 1836.

Xyrideae Kunth in Humb. & Bonpl. Nov. Gen. et Sp. (quarto text) **1**: 225. 1816; folio text **1**: 203. 1816 (both dates fide Barnhart). Endl. Gen. Pl. **1**: 123. 1841. Benth. & Hook. Gen. Pl. **3**: 841. 1883. *Abolbodaceae* Nakai, Ordines, familiae tribi [etc.] in praelectionibus anni 1937

---

[3] Mem. N. Y. Bot. Gard. **10**: 1–19. 1958.

[4] Pollen morphology and plant taxonomy 453, 454. 1952.

[5] Ordines, familiae, tribus (etc.) in praelectionibus anni 1937.

Inflorescence scapose, capitate or in one genus open; perianth regular or somewhat zygomorphic; sepals 3 or 2, the posterior members often strongly conduplicate and decussate; petals 3, free to the base or the claws connate into a tube; stamens opposite the petals, 3, the anthers more or less sagittate; staminodia 3, penicillate or simple, or lacking; ovary superior, 3-locular and the placentation axial, or unilocular with parietal or basal placentation; styles simple or divided; ovule anatropous; embryo erect, the endosperm more or less prominent.

Perennial, herbaceous, more often acaulescent or short-stemmed herbs; leaves rosulate or distichous, often decussate; mostly of marshy or boggy habitats; four genera in tropical America, only *Xyris* also of pantropic and temperate distribution.

Type genus: *Xyris* Linnaeus.

Key to the Genera

1. Petals yellow, free to the base; stylar appendage lacking; pollen grains espinose; seed globose-ovoid, vertically striate, usually biapiculate.
    2. Rhizomatous, caulescent perennial herb; inflorescence open, the flowers pedicellate; sepals 3, not keeled; staminodia lacking; pollen grains sphaeroidal, non-aperturate. 1. *Achlyphila.*
    2. Non-rhizomatous, usually acaulescent herb; inflorescence capitate; sepals 3, the two lateral strongly compressed and keeled; staminodia conspicuous, penicillate; pollen grains usually elongate, aperturate, without spines. 2. *Xyris.*
1. Petals more or less strongly united at the base into a tube; stylar appendage evident or conspicuous; pollen grains spinose; seed compressed or subprismatic or obliquely truncate and often obliquely striate.
    3. Caulescent perennial herb with rosulate or cauline leaves; corollas yellow, porrectate, irregular, exceeding 3 cm in length; seed much compressed, broadly winged and usually mitten-shaped. 3. *Orectanthe.*
    3. Acaulescent (commonly) perennial herb with basal or rosulate, seldom cauline leaves; corollas blue or sometimes white, essentially regular, 2 cm or less long; seed prismatic, obliquely truncate. 4. *Abolboda.*

Achlyphila Maguire & Wurdack, gen. nov.

Inflorescentia terminalis, pauciramosa; floribus trimeris, pedicellatis, distichis bracteatis; sepalis 3, imbricatis, subaequalibus; petalis 3, liberis, flabellinervatis; staminibus 3, petalis appositis, antheris extrorsis sagittatis, versatilibus; granis pollinis sphaeroideis, non-aperturatis; staminodiis nullis; ovario 3-loculari, placentis axialibus; ovulis anatropis; stylo simplici; capsula septicidali; seminibus sphaeroideo-ovatis, eis *Xyridis* superficialiter similibus.

Herbae perennes rhizomatosae; caulibus compressis foliosis; foliis distichis equitantibus.

Achlyphila from ἀχλύς, cloud or mist, φίλος, loving, an indication of habitat.

1. **Achlyphila disticha** Maguire & Wurdack, sp. nov. Fig. 1.

Herbae perennes 30–40 cm altae, rhizomatibus horizontalibus ramosis tenuibus, 2–3 mm diam., nodis vulgo 2–4 mm separatis; caulibus foliosis glabris compressis 1.5–3.0 mm latis, nodis 12–15 mm separatis; foliis numerosis, rigide equitantibus, distichis; vaginis 4.5–6.5 cm longis, valde conduplicatis, in ligula conduplicata scariosa, lineari-lanceolata acumine 3–5 mm longo terminatis; laminis 4–6 cm longis lineari-lanceolatis, acutis, conspicue aristatis, 2–3 mm latis, glabris, marginibus minute granulari-scabridulis; pedunculis solitariis terminalibus, valde compressis 10–15 cm longis, ca. 3.5 mm latis, marginibus

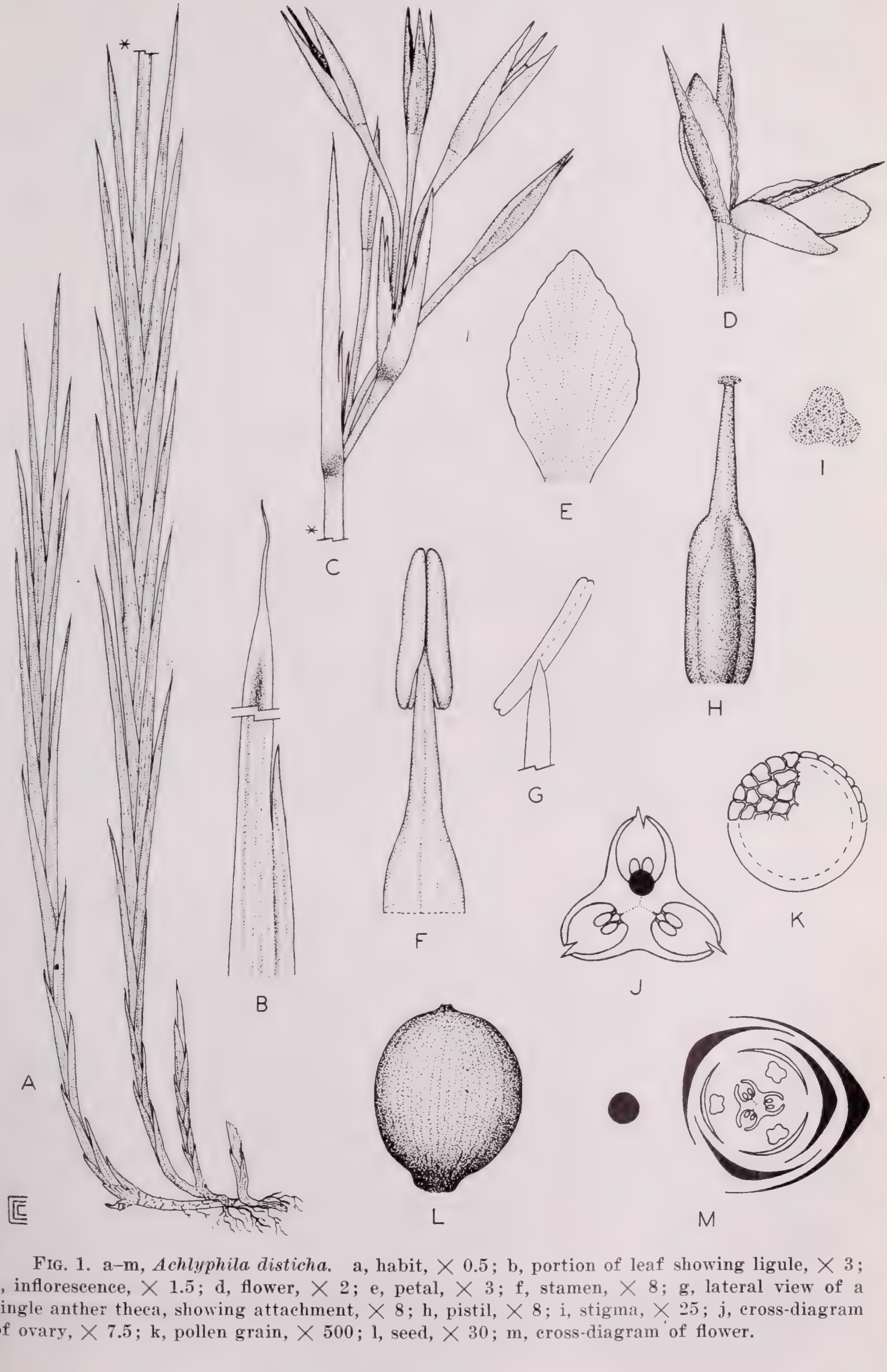


FIG. 1. a–m, *Achlyphila disticha.* a, habit, × 0.5; b, portion of leaf showing ligule, × 3; c, inflorescence, × 1.5; d, flower, × 2; e, petal, × 3; f, stamen, × 8; g, lateral view of a single anther theca, showing attachment, × 8; h, pistil, × 8; i, stigma, × 25; j, cross-diagram of ovary, × 7.5; k, pollen grain, × 500; l, seed, × 30; m, cross-diagram of flower.

plus-minusve granulari-scabridulis; inflorescentiis pauciramosis ramis distichis, bracteis primariis rigide erectis foliaceis 3–6 cm longis, aristatis vulgo 2 flores subtendentibus, flore altero cum prophyllo subtendenti, bracteis successivis (2–5) gradate parvioribus, quoque vulgo flores duos subtendenti, ultima vulgo flores tres subtendenti; pedicellis compressis 3-angulatis 15–30 mm longis; sepalis 3, lanceolatis acutissimis involuto-conduplicatis, scario-marginatis, 5–7 mm longis, ca. 1.5 mm latis, conduplicatis, imbricatis, duobus posterioribus subappositis, valde erectis, ca. 7 mm longis, anteriori deflexo (in anthesi) ca. 5 mm longo; petalis 3, flavidis, rhomboideo-ovatis, ca. 10 mm longis, ca. 6 mm latis, obtusis, ad basim late sessilibus, plus-minusve 20-flabellinervis; staminibus 3, petalis appositis, 5.0–5.5 mm longis, filamentis 3.5–4.0 mm longis, ad basim tumidis, antheris versatilibus evidenter extrorsis, 2.0–2.5 mm longis, sagittatis, in maturitate 2-thecatis, lobis basilaribus obtusis 0.7–0.8 mm longis, apice emarginato; granis pollinis sphaeroideis non-aperturatis, 32–34 μ diam., sporodermis subtesselatis (ad × 830 mag.); ovario trigonali 3-loculari, placentis axialibus in quoque loculo 2-seriatis, stylo simplici, stigmate minute 3-lobato; seminibus sphaeroideo-ovatis, minute biapiculatis, minute longitudine longistriatis, 1.5–2.0 mm longis.

VENEZUELA: Amazonas: Cerro de la Neblina, approach to southeast escarpment, upper Cañon Grande Basin, alt. 2000 m; perennial herb with horizontal rootstock and strongly distichous leaves; flowers yellow; common in low *Bonnetia-Tyleria* scrub bush; 14 Dec 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42402* (holotype NY); near east escarpment of upper Cañon Grande Basin, alt. 2000 m; perennial herb with yellow flowers; *Maguire, Wurdack & Maguire 42386* (paratype).

The monotypic genus *Achlyphila* is known only from the upper basin of Cañon Grande on Cerro Neblina, where it is locally common as an understory plant in low *Bonnetia-Tyleria* scrub woodland. There on the southeast cumbre at 2000 m altitude the landscape is almost constantly bathed in clouds that pour over the eastern escarpment and flow down across the basin. The name *Achlyphila* indicates this environment.

2. **Xyris** Linnaeus, Sp. Pl. 42. 1753.

With more than 250 species, *Xyris* is taxonomically the most complex and geographically the most widespread genus of the family. The largest concentration of species and probably the chief centers of distribution of *Xyris* occur in tropical America. The genus is prominently represented in marshy or wet areas in North America, Africa, Asia, and Australia, but is lacking in Europe.

Xyris has been divided taxonomically into three sections, viz., sect. *Pomatoxyris* Endlicher (Gen. Pl. 124. 1841), characterized chiefly by a basally 3-locular capsule, with perhaps fewer than twenty species confined to Australia; sect. *Euxyris*, characterized by a unilocular capsule and parietal placentation, of possibly more than one hundred pantropical and North American species; and sect. *Nematopus* Seubert (Fl. Bras. **3**^{1}: 211. 1855), in which the capsule is likewise unilocular, but the placentation basal, of probably more than one hundred species confined to tropical America.

3. **Orectanthe** Maguire, Mem. N. Y. Bot. Gard. **10**: 2. 1958.

The two species are known only from South American Guayana, and there are confined to higher elevations on Roraima sediments.

4. **Abolboda** Kunth in Humb. & Bonpl. Pl. Aequin. **2**: 25. 1809.

At this writing, there are seventeen recognized species of *Abolboda* (Maguire, l.c.), all from Amazonian and northeastern South America.

Relationship.

The four genera are here held together by a community of structural identities. They commonly have a floral formula that may be expressed 3—3—0 + 3—3; the petals are all flabellinerved; the anthers are all sagittate; the ovary is superior; the ovules and seed have small, erect embryos and copious endosperm. In gross habit a similarity pervades the four genera, the axis being short and the leaves rosulate in *Abolboda*, or the stems elongate and leaves rosulate or imbricate in *Orectanthe*, or the leaves rosulate-distichous in *Xyris*, distichous in *Achlyphila*. All are marsh herbs, or of sandy areas subject to inundation, or plants otherwise of wet habitat.

This similarity, identity and concomitance of structure, and prevailing character of habit and habitat conclusively align the four genera in a single family, and mutually exclude them from any other monocotyledonous family or families. Yet generic differences are strong and clear-cut, as evidenced by gross morphology and histological structure, which together with geographic factors suggest an ancient phyletic history.

Dr. Carlquist's studies provide evidences that support our taxonomic interpretation of taxa of the Xyridaceae at both the specific and generic level. Particularly, his findings on pollen grain structure lend credence to our alignment of *Achlyphila* with the other three genera of the Xyridaceae, and provide additional evidence supporting the separation of *Abolboda* and *Orectanthe*. Further, these studies demonstrate a considerable fundamental structural similarity among the four genera.

The anatomical structure of the leaves shows a close generic affinity, while the anatomy of roots, sepals, and petals in varying degrees reveals distinct generic segregation among the major taxa.

MARANTACEAE

Monotagma rhodantha Maguire & Wurdack, sp. nov.

Herba perennis ad 1.5 altam; caudicibus brevibus dense et copiose stramineo-pilosis; foliis basilaribus 2 vel pluribus; vaginis angustis 15–20 cm longis, sparse hirtellis; petiolis 50–60 cm longis, teretibus, hirtelliscentibus, cuticulis exfoliatis; pulvino 2–3 cm longo; laminis lanceolatis acuminatis vulgo 20–25 cm longis, 6–10 cm latis, ad basim subcordatis, aliquantum asymmetricalibus, subtus fere glaucis; marginibus integris; costa breviter ultra mediam extendens; venis lateralibus ca. 1 mm separatis ad angulum 60° adscendentibus; culmis floırigeris fere glaucis, multum longioribus quam foliis basilaribus, vulgo ca. in medio folio parviore affixo; eorundem vaginis 8–12 cm longis, petiolis 2–3 cm longis, articulo nullo; inflorescentiis biramis, a bracteis conspicuis vaginatis et duobus prophyllis parvioribus subtentis, bracteis 3–4 cm longis; ramis simplicibus vel vulgo (bis vel plus) ramosis, lateralibus secundifloris, ultimo spicato; bractea floris primarii sessili, aliquantum asymmetricaliter conduplicato, late obovato obtuso aliquantum cucullato et apiculato, 14–20 mm longo, 10–14 mm lato, plurinervato, purpureo-rubro, 2–4 flores subtendenti; quoque flore a bractea unica subtento, bracteis secondariis parvioribus et angustioribus, barbellatis, stipite

brevi affixis; sepalis squamosis scariosis ovato-orbicularibus, ca. 1.5 mm longis, fere 3-nervatis, nervis brevibus; tubo corollae ca. 15 mm longo, tenui prominenter nervato; lobis corollae oblongo-orbicularibus, cucullatis, 3-nervatis, 4–5 mm longis; staminodio 1, petaloideo, 4–5 mm longo; stamine 1, filamento carneo ca. 3 mm longo, anthera declinata ca. 1 mm longa; ovario superiori brevistipitato, 1-loculari, 1-ovulato; placenta basilari; stylo ca. 2 mm longo, 1-nervato; stigmate elliptico-capitato, ca. 1 mm longo; capsula 3-valvata, 6–7 mm longa; seminibus non visis.

VENEZUELA: Amazonas: Cerro de la Neblina, occasional along Cañon Grande, southwest of Cumbre Camp, alt. 1050–1100 m, herb 1.0–1.5 m high, forming clumps; leaves glaucous beneath, bracts deep red, corollas pink; 25 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42501* (holotype, 2 sheets, NY). Brazilian-Venezuelan boundary: western foothills of Serra Imeri, near Salto de Huá (southwest of Cerro de la Neblina), alt. 800 m, 27 Nov–8 Dec 1930, *Holt & Blake 508* (paratype NY).

This remarkably distinctive species has apparently been only twice collected. No immediate relatives are recognized for it. The description is offered above apart from the consideration of the main body of our Marantaceae, to make the name available for use in morphological study that is being made elsewhere.

BROMELIACEAE[6]

Cottendorfia nubigena L. B. Smith, sp. nov. Fig. 2.

Florigera 1 m alta; foliis 7 dm longis, subtus dense stellato-lepidotis, basi excepta mox glabris, basi obscure laxeque serrulatis, alibi integris, vaginis oblongis, quam laminis vix latioribus, pallidis, laminis angustissime triangularibus, ad 25 mm latis, planis; scapo recto, 10 mm diametro, lepidibus stellatis albidis villoso; scapi bracteis subfoliaceis, erectis, quam internodiis longioribus sed scapum haud occultantibus; inflorescentia laxe bipinnatim paniculata, lepidibus stellatis minutis ferrugineis praedita; bracteis primariis anguste triangularibus, quam ramorum basibus sterilibus nudis applanatis ad 7 cm longis subduplo brevioribus; ramis patentibus, sursum curvatis, 16 cm longis, dense florigeris; bracteis florigeris triangularibus, pedicellos crasse cylindricos 2–3 mm longos subaequantibus; floribus patentibus, nullo modo secundis; sepalis late ellipticis, 5 mm longis, basibus lepidum verruculosis, integris; petalis obtusis, 13 mm longis, stamina superantibus, albis; seminibus caudatis.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, alt. 2100 m; occasional in savannas 4–6 km northeast of Cumbre Camp, 20 Nov 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42151* (type).

This and the following species differ from the nearly related *C. cylindrostachya* in their narrower leaves with less persistent indument and in the length of the floral bracts relative to the pedicels.

Cottendorfia savannensis L. B. Smith, sp. nov. Fig. 3.

Florigera 2 m alta; foliis 6 dm longis, subtus dense stellato-lepidotis, basi excepta mox glabris, basi spinis planis rectis 1 mm longis subdense serrulatis, alibi integris, vaginis ellipticis, 4 cm longis, brunneis; laminis angustissime triangularibus, ad 25 mm latis, planis; scapo recto, lepidibus stellatis albidis villoso; scapi bracteis subfoliaceis, erectis, supremis internodia subaequantibus; inflorescentia laxe bipinnatim paniculata, lepidibus minutis stellatis vel linearibus albidis sparse vestita; bracteis primariis anguste triangularibus, quam ramorum basibus sterilibus nudis applanatis ad 6 cm longis duplo vel triplo brevioribus; ramis patentibus, sursum curvatis, lateralibus ad 19 cm longis, subdense florigeris; bracteis florigeris triangularibus, minutis, quam pedicellis graciliter cylindricis 12 mm longis multo brevioribus; floribus patentibus, nullo modo secundis; sepalis late ellipticis, 5 mm longis, sublaevibus glabrisque, integris; petalis obtusis, 13 mm longis, stamina superantibus, albis vel roseis; seminibus caudatis.

---

[6] By Lyman B. Smith. Illustrated by Robert J. Downs.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, alt. 2000–2100 m, common in wet savannas 4–6 km southwest of Cumbre Camp, 21 Nov 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42167* (type).

The above species differs from *C. nubigena* in its distinctly serrate leaves and elongate pedicels.

Pitcairnia wurdackii L. B. Smith, sp. nov. Fig. 4.

Florifera 1–2 m alta; foliis interioribus solum cognitis, ad 7.5 dm longis, laminis linearibus, acuminatis, pungentibus, 15 mm latis, supra glabris, subtus dense adpresseque cinereo-lepidotis, spinis atris sursum curvatis 3 mm longis laxe serratis; scapo erecto, 13 mm diametro, glabro; scapi bracteis erectis, infimis subfoliaceis, imbricatis, supremis anguste triangularibus, quam internodiis brevioribus, integris, apice lepidotis; inflorescentia subsimplici (basi ramo brevissimo unico praedita), 65 cm longa, glabra, ex sicco nigrescente; bracteis florigeris ellipticis, acutis, 20 mm longis, pedicellos superantibus, integris, margine nervatis, alibi ex sicco rugosis; floribus suberectis; pedicellis graciliter cylindricis, ca. 12 mm longis, valde sulcatis; sepalis lineari-lanceolatis, acutis, 4 cm longis, ecarinatis; petalis 6 cm longis, nudis, pallide viridibus; staminibus inclusis; ovario ca. ½ infero; capsula apice dehiscente; seminibus alatis.

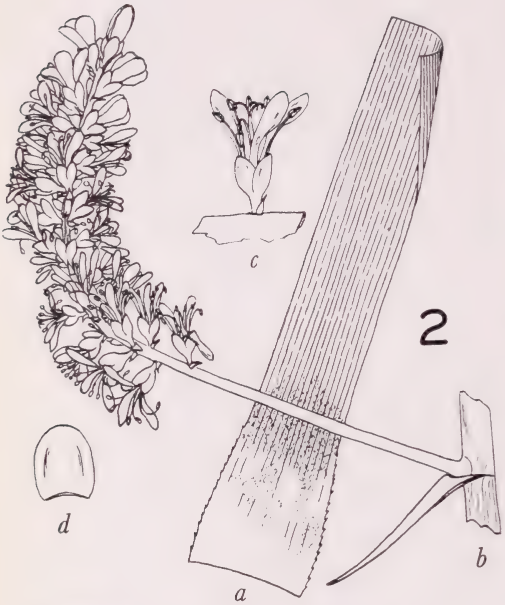
VENEZUELA: Amazonas: Río Yatua, alt. 100–140 m, locally abundant on Laja Catipan, 26 Sep 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 41584* (type).

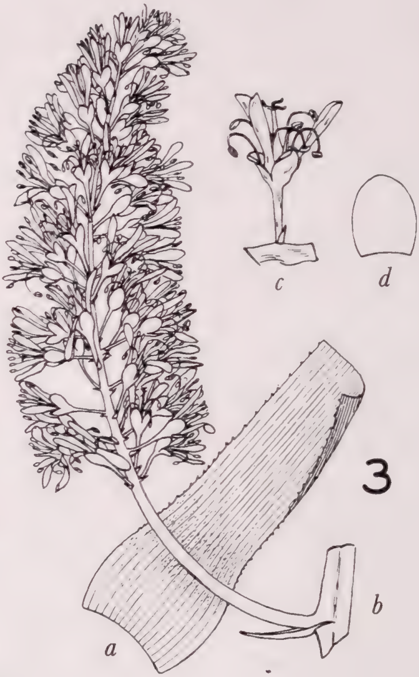
From the nearly related *P. turbinella* this species differs in its completely glabrous inflorescence and from *P. bulbosa* in its entire upper scape-bracts and nearly simple inflorescence.

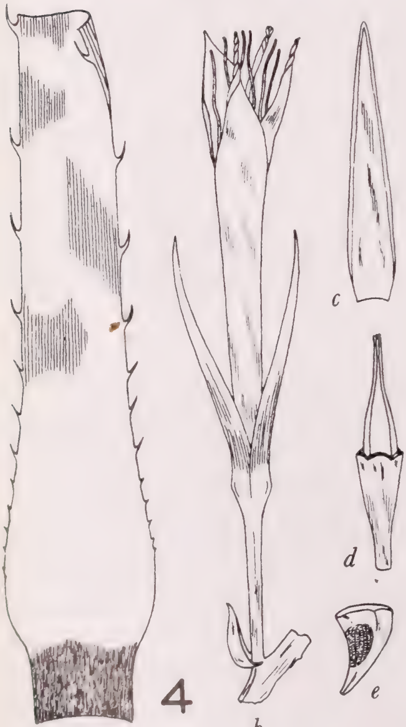
Pitcairnia maguirei L. B. Smith, sp. nov. Fig. 5.

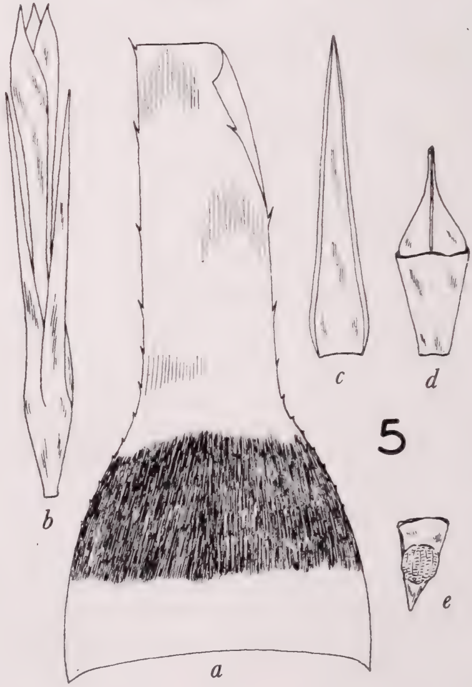
Florifera 1.5 m alta; foliis ad 6 dm longis, vaginis suborbicularibus, 3 cm longis, subglabris, castaneis, lucidis, laminis linearibus, acuminatis, pungentibus, 17 mm latis, utrinque dense adpresseque cinereo-lepidotis, spinis atris sursum curvatis 1 mm longis laxe serratis; scapo erecto, 8 mm diametro, dissite albido-lepidoto; scapi bracteis erectis, infimis subfoliaceis, dense imbricatis, supremis anguste triangularibus, internodia subaequantibus, serrulatis, basi excepta dense lepidotis; inflorescentia simplicissima, 45 cm longa, subdense multiflora, bracteis florigeris infimis exceptis glabra, ex sicco nigrescente; bracteis florigeris ovatis, acutis, ad 25 mm longis, ovarium superantibus vel subaequantibus, integris, nervatis, rubris, pallide angusteque marginatis; floribus subsessilibus, divergentibus; sepalis lineari-lanceolatis, acutis, 4 cm longis, ecarinatis; petalis acutis, 6 cm longis, nudis, pallide viridibus; staminibus inclusis; ovario ca. ⅔ infero; seminibus alatis.

VENEZUELA: Amazonas: Alto Río Orinoco, alt. 130–200 m, locally frequent on Esmeralda ridge, 20 Sep 1957, *B. Maguire, J. J. Wurdack & W. M. Keith 41556* (type).


2


3


4


5

This species differs from the closely related *P. wurdackii* in its completely lepidote leaf-blades and subsessile flowers.

Brocchinia delicatula L. B. Smith, sp. nov. Fig. 6.

Florifera 20–35 cm alta; caule erecto, 3 cm vel altiore, 8 mm diametro, basibus vetustis atris foliorum dense vestito; foliis apice caulis rosulatis, ad 16 cm longis, dissite adpresseque lepidotis, vaginis latissime ovatis, 1 cm longis, atro-castaneis, sublucidis, laminis linearibus, acuminatis, 4 mm latis, planis, dense nervatis, pallide viridibus, integris; scapo erecto, gracillimo, glabro; scapi bracteis erectis, remotis, parvis, anguste triangularibus, dissite lepidotis; inflorescentia laxe bipinnatim paniculata, 5–13 cm longa, glabra; bracteis primariis eis scapi similibus, quam basibus sterilibus nudis ramorum brevioribus; ramis divergentibus, 3–5 cm longis, gracillimis, laxe paucifloris; bracteis florigeris ovatis, acutis, 2.5 mm longis, membranaceis; floribus divergentibus, breviter pedicellatis; sepalis oblongis, obtusis, 2.5 mm longis, membranaceis, stramineis; petalis oblongis, obtusis, 3.5 mm longis, haud unguiculatis, albis; staminibus inclusis, filamentis cum sepalis petalisque brevissime coalitis; ovario clavato, 5 mm longo, minime supero, stylis distinctis, gracilibus.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, alt. 1100 m, locally abundant in rock crevices along Cañon Grande east of Cumbre Camp, 24 Nov 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42207* (type).

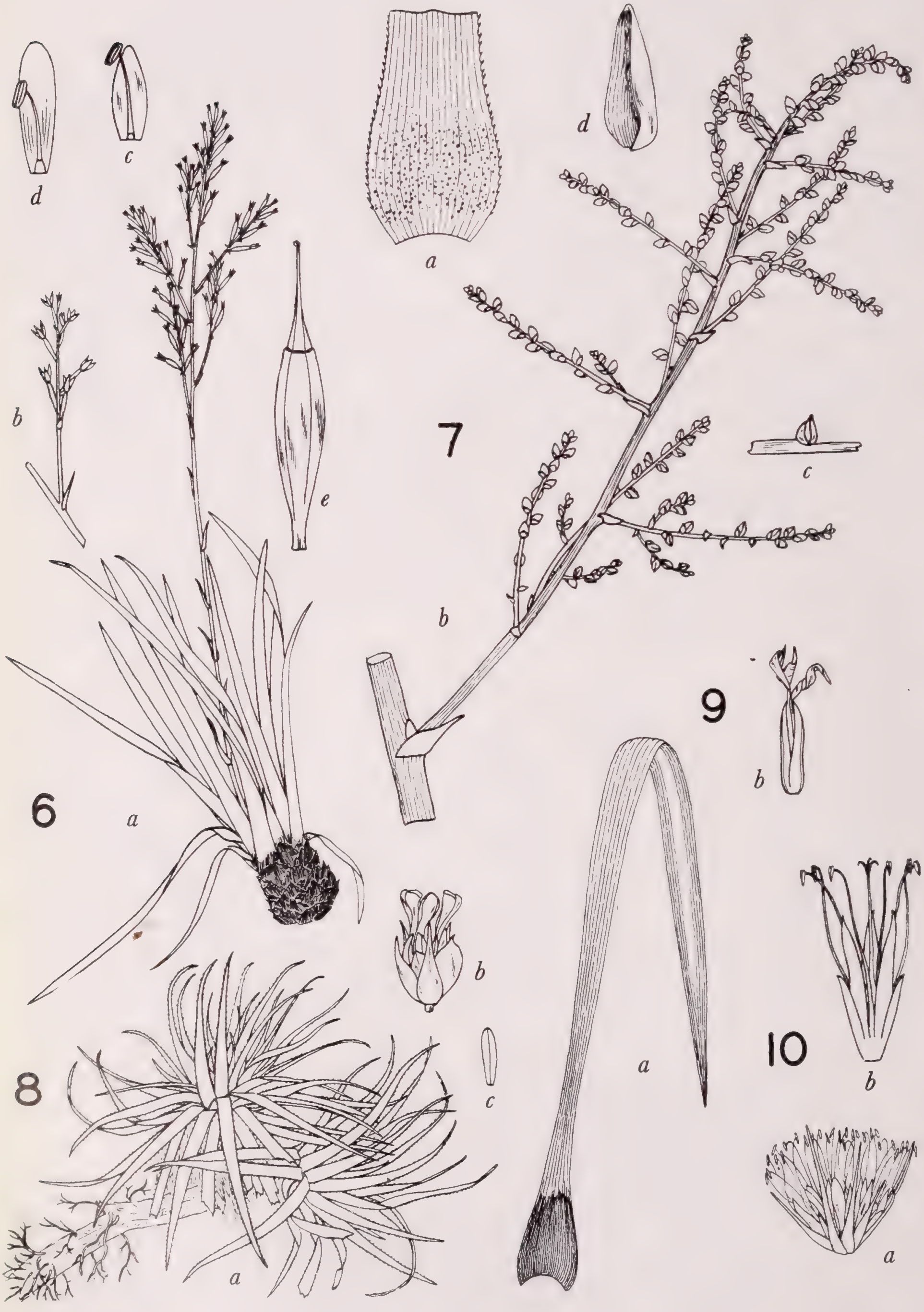
This species is by far the smallest and most delicate in *Brocchinia* and is easily distinguished by its habit alone. It belongs with the species with prominently nerved leaf-blades and glabrous inflorescences but does not appear closely related to any of them.

Navia diffusa L. B. Smith, sp. nov. Fig. 7.

Florifera ad 3 m alta; foliis interioribus solum cognitis, ad 4 dm longis, subdense serrulatis, supra glabris, vaginis late ovatis, ca. 4 cm longis, brunneis, subtus lepidibus albidis orbicularibus adpressis subdense vestitis, laminis anguste triangularibus, nullo modo contractis, 27 mm latis, subtus obscure dissiteque lepidotis; scapo 2 cm diametro; scapi bracteis erectis, foliaceis, dense imbricatis; inflorescentia laxissime 3–4-pinnatim paniculata, glabra; bracteis primariis late ovatis, acuminatis, quam basibus sterilibus ramorum brevioribus, infimis serrulatis; ramis ad 28 cm longis; bracteis florigeris latissime ovatis, quam sepalis subduplo brevioribus; floribus patentibus, sessilibus; sepalis liberis, cochleari-imbricatis, late ovatis, obtusis, 4 mm longis; petalis juvenilibus solum cognitis, inclusis; ovario supero.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, alt. 1900 m, frequent on edge of north escarpment, 23 Dec 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42537-E* (type).

FIGS. 2, 3. *Cottendorfia*. FIG. 2. *C. nubigena* (*Maguire, Wurdack & Maguire 42151*). a, base of leaf, × 0.5; b, branch of inflorescence, × 0.5; c, flower, × 1; d, sepal, × 2. FIG. 3. *C. savannensis* (*Maguire, Wurdack & Maguire 42167*). a, base of leaf, × 0.5; b, branch, × 0.5; c, flower, × 1; d, sepal, × 2. FIGS. 4, 5. *Pitcairnia*. FIG. 4. *P. wurdackii* (*Maguire, Wurdack & Maguire 41584*). a, base of leaf, × 1; b, flower, × 1; c, sepal expanded, × 1; d, ovary, × 1; e, seed, × 5. FIG. 5. *P. maguirei* (*Maguire, Wurdack & Keith 41556*). a, base of leaf, × 1; b, flower, × 1; c, sepal expanded, × 1; d, ovary, × 1; e, seed, × 5.


d
c
b
6
a
e
a
7
d
c
b
9
b
8
b
c
a
a
10
b
a

In my key in the previous report (Mem. N. Y. Bot. Gard. **9**: 295), this species runs down to the vicinity of *N. brocchinioides* but is quickly distinguished by its short pinnately arranged spikes.

Navia abysmophila L. B. Smith, sp. nov. Fig. 8.

Acaulis vel breviter caulescens; caule ad 10 cm longo, pauciramoso, 5 mm diametro, mox nudo; foliis multis, apice caulis densissime aggregatis, ad 6 cm longis, interioribus aream coloratam circa inflorescentiam haud formantibus, vaginis integris, infimis subtriangularibus, parvis, supremis suboblongis, ca. 1 cm longis, laminis linearibus, acuminatis, 3.5 mm latis, basi haud contractis, subtus valde nervatis cretaceisque, mox utrinque glabris, spinis minutis subdense serrulatis; inflorescentia subsessile, simplici, pauciflora, 5 mm diametro; bracteis exterioribus subfoliaceis sed valde reductis; bracteis florigeris late ellipticis, acutis mucronulatisque, 8 mm longis, omnino membranaceis, pallide brunneis, lepidibus minutis linearibus pallidis sparsissime vestitis; sepalis oblongis, obtusis cucullatisque, 7 mm longis, posterioribus anguste alato-carinatis; petalis albis; staminibus inclusis; ovario supero.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, alt. 1100 m, locally frequent on rocks in bottom of Cañon Grande south-southwest of Cumbre Camp, 24 Dec 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42471* (type). The species is also represented by number 42202 from east of Cumbre Camp.

This novelty closely resembles *Navia cucullata* but differs in having the young leaves cretaceous beneath and the floral bracts acute and uniformly membranaceous.

Navia affinis L. B. Smith, sp. nov. Fig. 9.

Caulescens; caule erecto, simplici, ad 12 cm alto, 7 mm diametro, foliorum vaginis vetustis praeditis; foliis juvenilibus terminalibus, subpetiolatis, ad 3 dm longis, apice obscure serrulato excepto integris, vaginis triangularibus, 3–4 cm longis, ex sicco rubentibus, margine villoso-lepidotis, laminis lineari-lanceolatis, acuminatis, 10 mm latis, marginibus paulo incrassatis; inflorescentia in centro foliorum sessili, ellipsoidea, 20 mm longa, 6 mm diametro, verisimiliter simplici; bracteis ellipticis, ca. 15 mm longis, sepala superantibus, subtenuibus, apice paulo incrassatis rubentibusque, dissite lepidotis, integri, laevibus; sepalis oblongis, obtusis, 12 mm longis, tenuibus, ½ connatis; petalis albis, reflexis et stamina nudantibus; ovario supero.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, alt. 1100 m, locally frequent on rocks in bottom of Cañon Grande south-southwest of Cumbre Camp, 24 Dec 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42470* (type).

FIG. 6. *Brocchinia delicatula* (*Maguire, Wurdack & Maguire 42207*). a, habit, × 0.5; b, branch of inflorescence, × 1; c, sepal and stamen, × 5; d, petal and stamen, × 5; e, ovary, × 5. FIGS. 7–10. *Navia.* FIG. 7. *N. diffusa* (*Maguire, Wurdack & Maguire 42537–E*). a, base of leaf, × 0.5; b, branch of inflorescence, × 0.5; c, flower, × 1; sepal expanded, × 5. FIG. 8. *N. abysmophila* (*Maguire, Wurdack & Maguire 42471*). a, habit, × 0.5; b, inflorescence, × 1; c, sepal, × 1. FIG. 9. *N. affinis* (*Maguire, Wurdack & Maguire 42470*). a, leaf, × 0.5; b, flower, × 1. FIG. 10. *N. parvula* var. *expansa* (*Maguire, Wurdack & Maguire 42246*). a, inflorescence, × 0.5; b, flower, × 1.

Only further collections will prove whether the above is a distinct species or only a variety of *N. subpetiolata.* At present it can be said to differ by its narrower leaf-blades and smaller, more highly connate sepals.

Navia parvula var. **expansa** L. B. Smith, var. nov. Fig. 10.

Caule elongato, pauciramoso; foliis ad 15 cm longis; floribus inflorescentiae pluribus; sepalo anteriori verisimiliter omnino abortivo; petalis erectis, anguste lanceolatis, 15 mm longis, aureis; staminibus longe exsertis.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, alt. 1200–1400 m, abundant in colonies on dry rock ledges in Cañon Grande east of Cumbre Camp, 26 Nov 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42246* (type). Number 42502 from dry cliff faces in forest south-southwest of Cumbre Camp at alt. 1050–1100 m is the same variety, and 42536 from the same cliffs but higher and in a sheltered area is intermediate between the two varieties.

The type of the species is its smallest form and occurs at the highest altitude, which indicates a correlation between shelter and size of plant. The material from this latest expedition provides good flowers which were lacking in the type, and thereby discloses several unusual characters. The petals are narrow and erect and the stamens long-exserted, but most remarkable is the absence of any trace of an anterior sepal. Such a situation can be considered the final phase in a reduction evolution which began by its being covered by the other sepals.

ANNONACEAE[7]

Guatteria longedecurrens R. E. Fr., sp. nov.

Arbor ca. 18 m alta; ramuli novelli nigrescentes, pilis sparsis mox deciduis instructi; internodia 1–2 cm longa. Foliorum petiolus ca. 5 mm longus, supra paulo canaliculatus; lamina 10–15 cm longa, 3–5 cm lata, ovato-lanceolata, basin versus longe acutata et in petiolum decurrens, rigida, apicem versus in cuspidem 1–1.5 cm longam obtusam sat sensim contracta, supra (exsiccata) sordide viridis, subtus olivacea; costa supra vix depressa, subtus valde prominens teres et rubescens; nervi laterales I tenues; reticulum venularum densissimum, utroque latere elevatum. Flos (unicus obvius) 2 cm longe pedunculatus; pedicelli rigidi, glabri. Petala oblonga, apice rotundata, exteriora ca. 14 mm longa, 6 mm lata, interiora ca. 15 mm longa, 7 mm lata. Stamina 1.5–2 mm longa, disco plano glabro. Monocarpia numerosa, immatura nigra, obovoidea, obtusa, 8–10 mm longa, 4–5 mm crassa, in stipitem 6–7 mm longum contracta.

VENEZUELA: Merida, Pueblos del Sur, alt. 1600–2200 m, *Bernardi 2255* (type NY, cotype S).

This species agrees in most respects with *G. glaberrima* R. E. Fr. (known from Ecuador), which, however, even in early stages of development has quite glabrous branchlets and leaves. In *G. longedecurrens* the network of veins is very elevated and conspicuous, especially on the under side. It differs from *G. glaberrima* also in its broader, ovate-lanceolate leaves.

Oxandra venezuelana R. E. Fr., sp. nov.

Arbor alta; ramuli glabri; internodia 1–1.5 cm longa. Foliorum lamina rigida, glaberrima, flavovirens, ovato-oblanceolata, basi rotundata vel brevissime

---

[7] By Robert E. Fries.

acutata, apice in cuspidem brevem acutam obtusiusculam sensim contracta, 8–13 cm longa, 3–4 cm lata; costa supra conspicue impressa, rubescens; nervi laterales et venularum reticulum densissimum utrinque conspicue prominentes. Flores in axillis foliorum delapsorum glomerati, fere sessiles; pedunculi brevissimi, post florationem ad 2 mm excrescentes, bracteolis minutis biseriatis retundatis aureo-sericeis dense instructi. Sepala rotundato-ovata, obtusiuscula, extus dense breviterque sericea, ca. 2.5 mm longa et lata. Petala oblanceolata, 12–14 mm longa, 5–7 mm lata, ad marginem brevissime ciliata. Stamina numerosa, flavida, apice recurvata, 3–4 mm longa. Pistilla numerosa, clavato-cylindrica, dense tomentella, ovulo basali unico erecto instructa. (Fructus ignotus.)

VENEZUELA: Merida: municipio El Vigia, selva pluvial submontana, alt. 150–200 m, 5 Feb 1955, *Bernardi 1923* ["Exemplares medidos de mas de 50 Ms. con 7/3 del tronco libre de ramas"] (type NY).

This species is particularly characterized by the rigid leaves rounded at the base. In this respect it most closely approaches *O. leucodermis* (Spruce) Warm., which also belongs to the Venezuelan flora. The new species proposed here is distinguished from the latter by a different nervation. The midrib is depressed on the upper side and the vein network is extremely close and elevated on both sides of the leaf.

Guatteria bernardi R. E. Fr., sp. nov.

Arbor; ramuli novelli cortice nigro obtecti et pilis divaricatis sat densis vestiti; internodia ca. 1 cm longa. Foliorum petiolus 2–3 mm longus, hirsutus; lamina 5–10 cm longa, 1.5–2.5 cm lata, membranaceo-rigida, exsiccata obscura, supra glabra, subtus pilis brevibus adpressis ± dense vestita, anguste lanceolata, basin versus angustata et apice in cuspidem 1–1.5 cm longum acutum contracta. Flores in axillis foliorum solitarii vel raro bini; pedicelli rigidi, usque ad 1.5 cm longi, vulgo recurvati, pilis patentibus rufis vestiti et primo bractea foliacea ad 1 cm longa mox caduca instructi. Sepala rotundata, acuta, mox valde recurvata, 4–5 mm longa. Petala erecta, tomentella, oblanceolata, demum 15–20 mm longa, marginibus valde recurvatis. Stamina 1 mm longa. Monocarpia numerosa, ovoidea, glabra, castanea, acuta, 9–10 mm longa, stipitibus rigidis, 4–7 mm longis sustenta. Semen ovoideum, glaberrimum, ca. 8 mm longum.

VENEZUELA: Bolívar: Calzeta de la Botella, 14 Apr 1957, *Bernardi 6534* (type NY, cotype S).

This species agrees with some forms of *G. schomburgkiana*, but differs from that species especially in its stipitate monocarps; the flowers have longer pedicels and the petals also are notably longer. Furthermore, the new species here described resembles *G. flavovirens* R. E. Fr. (also known from Venezuela) which, however, differs in its conspicuously prolonged leaf apices, shorter peduncles, and shorter petals.

Annona gigantophylla (R. E. Fr.) R. E. Fr., comb. nov.

Xylopia gigantophylla R. E. Fr. Ark. Bot. II. 3: 605. 1956.

A recent fruiting collection of this species (*Maguire, Wurdack, & Maguire 42060-A*, from the slope forest of Cerro de la Neblina) has revealed the typical fleshy fruit of the genus *Annona*.

RUTACEAE[8]

In the following account several taxa are described as new, but I have also included descriptions of older taxa which were not fully characterized originally or which are much better known now as a result of numerous recent collections. In citing the place of deposit of these collections, the reference to the New York Botanical Garden sheet of the Maguire et al. collections has been omitted, since it is certain that the first set of these will be found in the New York herbarium.

Raveniopsis Gleason, Brittonia **3**:166. Oct 1939.

Shrubs or small trees, mostly with simple leaves. Inflorescence a simple raceme, or dischasial with two cincinnoid racemes and a terminal flower at the apex of the peduncle, or rarely the flower solitary; flowers pentamerous, the calyx, corolla, and androecium variously zygomorphic. Sepals free or very shortly united basally, usually obviously foliaceous, generally considerably longer than wide, imbricate. Corolla tube cylindric, arcuate, flaring toward the apex in a spreading limb, the petals unequal. Fertile stamens two, the ligulate filaments more or less joined with those of the three or more staminodia in a filament tube, adherent to the corolla tube at the base or much higher, the anthers with saccate to flabellate appendages at their base. Disk cupular, usually completely enclosing the ovary, truncate to somewhat lobate. Stigma obliquely 5-lobed, the style slender, the ovary 5-carpellate, the carpels free except in the styles; ovules 2 in each carpel. Fruit of 1–5 cocci, each one-seeded, dehiscing longitudinally, the exocarp separating from the whitish endocarp.

Type species: *Raveniopsis tomentosa* Gleason, op. cit. 167.

As Gleason indicated in his original publication of this genus, several differences separate it from the allied genus, *Ravenia*. Before the present publication, *Ravenia* has been considered to occur both in the lowlands and on the summits of the table-mountains of Guayana, but the species of the latter region are herein transferred to *Raveniopsis*.

The principal, technical characteristic that separates the two genera, as interpreted here, is the presence of basal appendages on the two fertile anthers of *Raveniopsis*; but there are at least two other *tendencies*: (1) in *Ravenia* the flowers are solitary or borne in few-flowered, subumbellate clusters or racemes, but in the allied genus the flowers are usually rather closely arranged in simple or dichotomous racemes or spikes; (2) in *Ravenia* the sepals are about as long as wide and not obviously foliose, in *Raveniopsis* the sepals are usually longer than wide and obviously foliose.

The species of *Raveniopsis* are found thus far exclusively on the summits of the tepuís in the Guayana Highland between 1000 and 2500 meters elevation; the greater number of species occurs at about the 2000-meter level. Thus an altitudinal disjunction is correlated with the morphological distinctions and supports the realignment of species presented here.

Key to the Species of *Raveniopsis*

1. Leaves trifoliolate, chartaceous to thinly coriaceous, never rigid. 2.
1. Leaves unifoliolate or simple, rigid. 3.
2. Inflorescence a simple raceme; larger sepals narrowly lanceolate, about 1.5 mm wide. Pubescence simple. 1. *R. trifoliolata.*

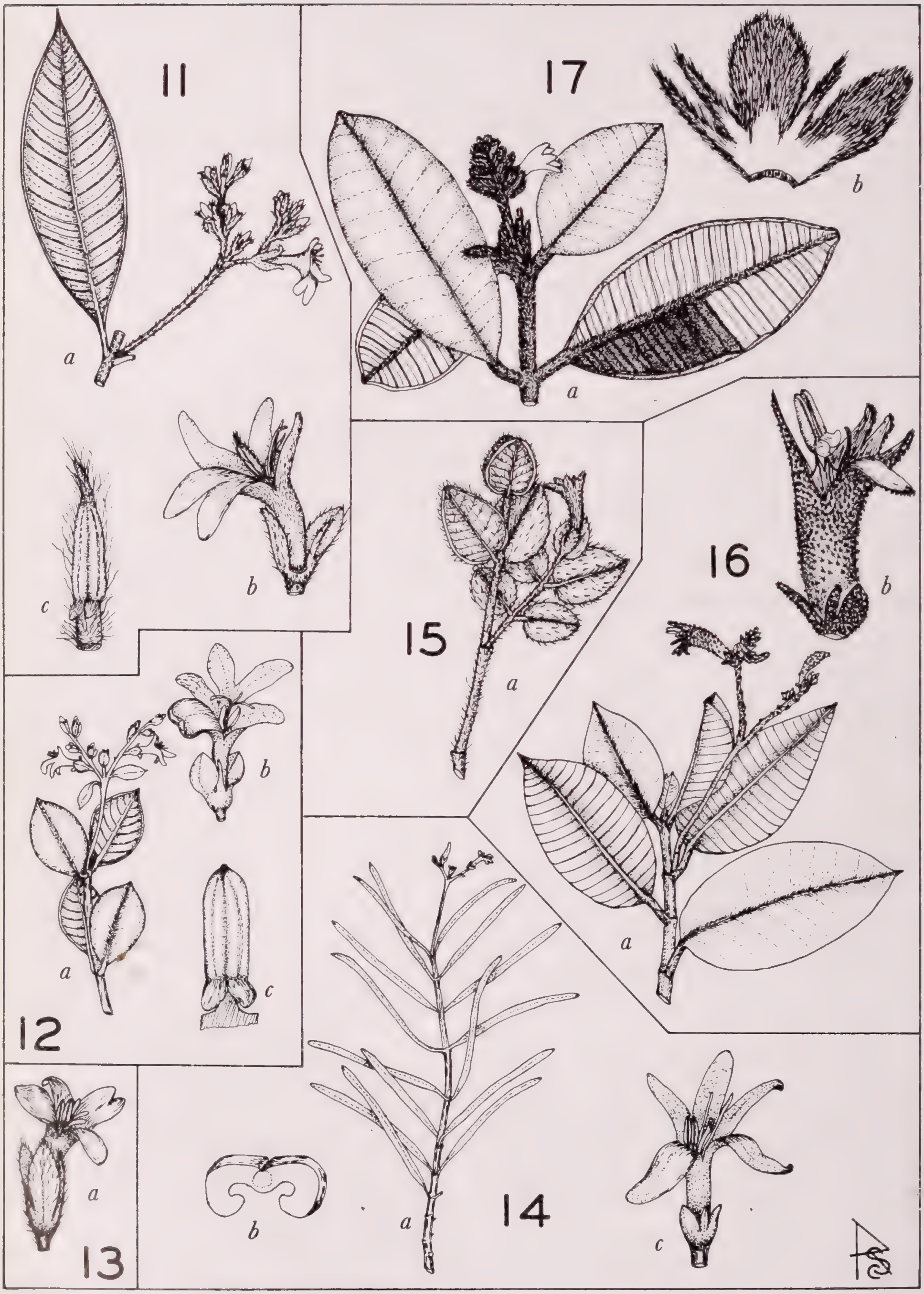
---

[8] By Richard S. Cowan.

2. Inflorescence dichasial, consisting of two cincinnoid racemes and a terminal flower at the apex of the peduncle (cf. Fig. 10d); larger sepals broadly ovate or ovate-oblong, 1.5–5 mm wide. Hairs compound, dendroid with the branches closely aggregated on the basal part of the main axis, the latter long-attenuate in a more or less rigid point. 2. *R. stelligera.*
3. Hairs simple 4.
3. Hairs compound, stellate or appearing so. 10.
4. Leaves linear, strongly revolute. Flowers about 6 mm long, the corolla tube nearly straight. 8. *R. linearis.*
4. Leaves elliptic, oval, or ovate. Flowers longer than 6 mm, the corolla usually obviously arcuate. 5.
5. Inflorescence spicate, the calyx thick, densely pilose-velutinous. Leaves and stems densely velutinous. 11. *R. nubicola.*
5. Inflorescence dichasial (cf. Fig. 10d), consisting of two cincinnoid racemes and a terminal flower at the apex of the peduncle, or the inflorescence reduced to a solitary flower. 6.
6. Flowers solitary. Vegetative parts hispid, the leaves ovate to broadly so. 7. *R. paruana.*
6. Flowers in dichasia (cf. Fig. 10d). Vegetative parts not hispid, the leaves elliptic, oval, or ovate. 7.
7. Leaves pilose on the undersurfaces. Corolla white; sepals elliptic-oblong. Fertile anthers lanceolate, mucronate by a prolongation of the connective about 1 mm long. 6. *R. abyssicola.*
7. Leaves strigulose, sericeous, or tomentose on undersurfaces. Corolla pale lilac, pink, or red; sepals ovate, lanceolate, or oblanceolate to elliptic. Fertile anthers oblong, not mucronate. 8.
8. Leaves strigulose only on primary veins beneath. Style pilosulose; corolla red. 3. *R. ruellioides.*
8. Leaves sericeous or tomentose on undersurfaces, the latter obscured by the pubescence. Style glabrous; corolla pale lilac or pink. 9.
9. Larger sepals broadly elliptic, 3–3.5 mm long; corolla tube 5.5 mm long. Leaves sericeous beneath. 4. *R. sericea.*
9. Larger sepals oblanceolate to narrowly elliptic, 5.5 mm long; corolla tube 9 mm long. Leaves usually tomentose beneath. 5. *R. fraterna.*
10. Pubescence buff-canescent, densely aggregated on most parts, the lower leaflet surfaces completely obscured, the hairs dendroid. Leaves strongly convex-revolute, not mucronate. Inflorescence spicate. 9. *R. tomentosa.*
10. Pubescence red-brown, not obscuring completely the lower leaf surfaces, the hairs stellate, stipitate. Leaves about plane, the midrib often extended beyond the blade in a short, rigid, blunt mucro. Inflorescence dichasial, consisting of two cincinnoid spikes and a terminal flower at apex of the peduncle (cf. Fig. 10d). 10. *R. peduncularis.*

1. **Raveniopsis trifoliolata** Cowan, sp. nov. Fig. 19.

Arbusculae 1–2 m altae, ramulis rubidis et minute strigulosis. Folia digitato-trifoliolata (interdum unifoliolata); petioli 27–40 mm longi, graciles, minute strigulosi, foliolorum lateralium petiolulis 1.5–3 mm longis, minute strigulosis, folioli terminalis petiolulis 5–10 mm longis; foliolorum laminae chartaceae, ellipticae, 5–9 cm longae, 3–4 cm latae, acutae, foliolorum lateralium base inaequilaterali, latere inferiore obtuso sed superiore attenuato-acuto, folioli terminalis base attenuato-cuneato, aequilaterali, supra glabrae, infra costa strigulosae sparse, costa salienti, venis primariis ca. 10-jugatis. Inflorescentiae axillares, solitariae vel binatae, unilaterale racemosae, 10–20 cm longae, pedunculo 4–6.5 cm longo, sparse puberulo, gracili, axe striguloso et puberulo, pedicellis 1–1.5 mm longis, minuto-strigulosis sparse. Sepala plus minusve chartacea, acuta, minute strigulosa sparse, duobus lanceolatis, 5.5–7 mm longis, 1.5 mm latis, sepalis ceteris ca. triangularibus, 1–1.5 mm longis, 0.5–1 mm latis. Corollae tubus curvatus, glaber, 10.5–12 mm longus, infundibuliformis, lobo 10 mm longo, 3.5 mm lato, lobis ceteris ca. 5–8 mm longis, 1.5–3 mm latis. Stamina 5, duobus fertilibus, filamentis ligulatis, 15 mm longis, antheris 2.5 mm longis,


11
a
b
c
17
a
b
15
a
16
a
b
12
a
b
c
13
a
b
14
a
c

FIGS. 11–17. *Raveniopsis.* FIG. 11. *R. abyssicola* (*Maguire, Wurdack & Maguire 42504*). a, portion of branchlet, × 0.5; b, flower with one sepal removed, × 1.5; c, fertile anther, × 5.

ad basem appendicibus flabellatis 1.3 mm longis ornatis; staminodia usque 20 mm longa, ciliolata. Discus 0.9 mm profundus, usque 1.5 mm diametro, margine crenulata; stylus 10–15.5 mm longus, glaber, ovarium sparse strigulosum. Fructorum cocci immaturum venosum, sparse strigulosum, mucronulatum.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua; locally abundant along Cañon Grande east of Cumbre Camp, alt. 1100 m; shrub 1–2 m; fls red; 24 Nov 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42217* (holotype, US no. 2267440).

As the specific epithet emphasizes, this species is easily separable from most of the other species of the genus by the digitately trifoliolate leaves. The calyx is also very distinctive in shape and the glabrous corolla contrasts with the pubescent corolla of most of the other species in the genus. The simple hairs on many of the parts of *R. trifoliolata* separates it easily from its nearest relative, *R. stelligera,* which also has trifoliolate leaves but differs in having stellate pubescence, a cincinnoid-racemose inflorescence, and a different calyx.

In the type collection are included a number of detached inflorescences which appear to be fasciated; instead of a simple raceme, which is characteristic of the species, the peduncle bears at its apex up to six racemose branches.

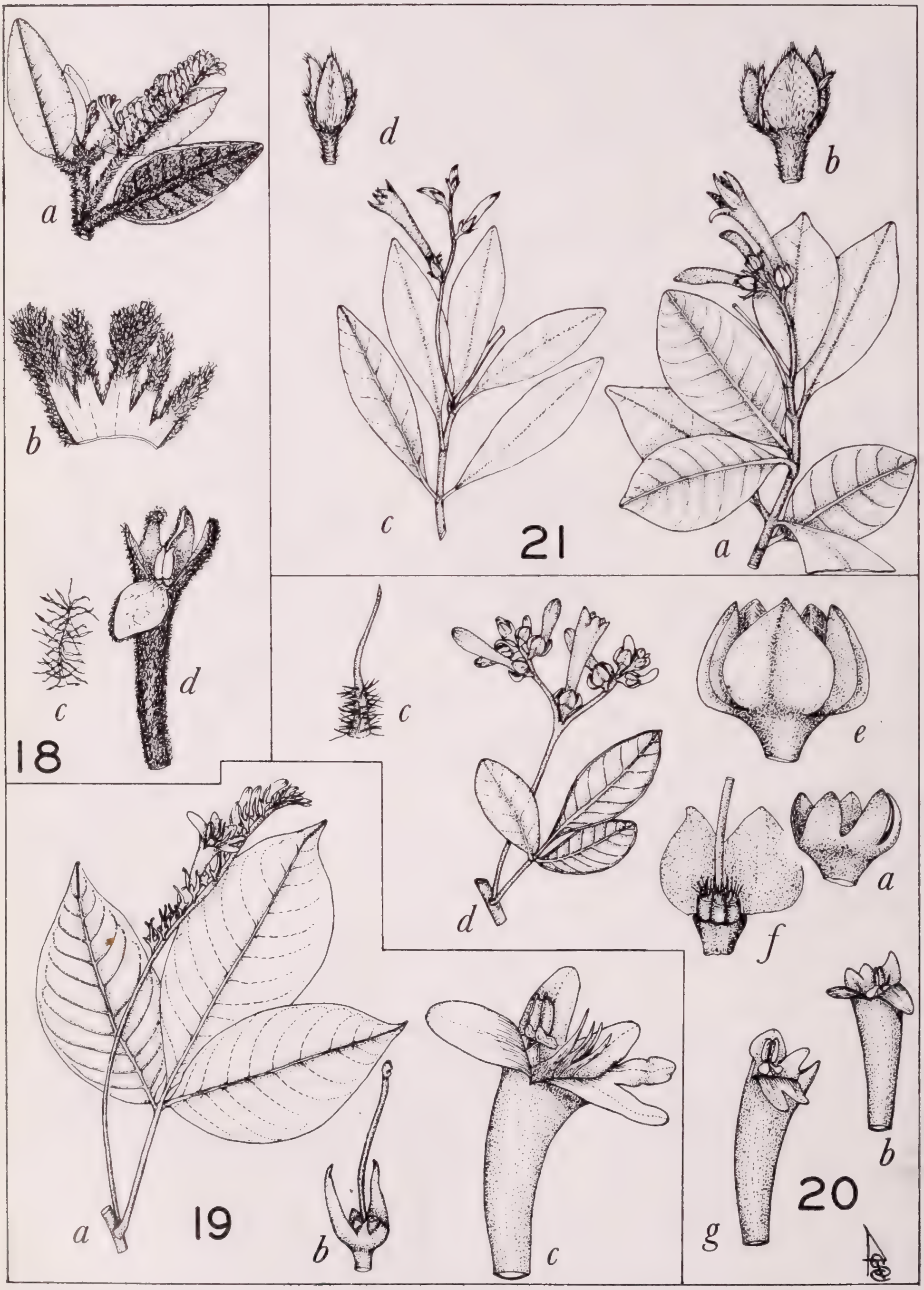
2. Raveniopsis steligera (Cowan) Cowan, comb. nov. Fig. 20.

Galipea stelligera Cowan, Mem. N. Y. Bot. Gard. **8**:121. Apr 1953.

Shrub or small tree 2–5 m tall, the branchlets densely pubescent with cinnamon-colored, dendroid-stellate hairs. Leaves digitately trifoliolate, dendroid-stellate (except the intervein areas on the upper surfaces), the petioles 1.5–2 cm. long, the petiolules of the lateral leaflets 1–2.5 mm long, that of the terminal one 5–9 mm long; leaflet blades chartaceous, elliptic to somewhat obovate or oblanceolate, the lateral leaflets smaller with the base inequilateral, the upper side attenuate-acute, the lower side rounded, 2–7 cm long, 1–2.5 cm wide, the apex acute or rounded and apiculate, the terminal leaflet larger, its base attenuate-acute, the apex acute, 4–7 cm long, 1–2.5 cm wide, the lower surfaces of the leaflets densely dendroid-stellate-pubescent, much paler than the dark green upper surface, the latter sparingly to sparsely stellate-pubescent on the larger veins, the costa and primary veins impressed above, salient beneath. Inflorescence dendroid-stellate-pubescent, axillary or psuedoterminal, dichasial, the 2–5-cm-long peduncle bearing at its apex one flower and two racemose branches, the bractlets about 1–3 mm long, subulate, caducous, the pedicels 0.5–1.5 mm long. Flowers pubescent with stellate and dendroid-stellate hairs, coral red to brick red, the sepals more or less unequal, oblong-oval to broadly ovate, obtuse or acute; corolla with a narrowly funnelform tube and erect limb, the tube slightly curved, 18–20.5 mm long, 6–7 mm in diameter, the adaxial corolla lobe triangular-lanceolate to broadly ovate, the other lobes triangular to ovate-triangular, acute. Fertile anthers 2.5–3 mm long, oblong, apiculate, the appendages 1.5 mm long, ca. 1 mm wide, flabellate, the staminodia 18.5–20 mm long, ca. 1 mm wide,

---

FIG. 12. *R. sericea* (*Wurdack 34297*). a, habit, × 0.5; b, flower, × 1.5; c, fertile anther, × 10. FIG. 13. *R. fraterna* (*Steyermark & Wurdack 811*). a, flower, × 1.5. FIG. 14. *R. linearis* (*Tate 531*). a, habit, × 0.5; b, transverse section of leaf, × 5; c, flower, × 3. FIG. 15. *R.* paruana (*Cowan & Wurdack 31225*). a, habit, × 0.5. FIG. 16. *R. peduncularis* (*Maguire 32754*). a, habit, × 0.5; b, flower, × 2. FIG. 17. *R. nubicola* (*Maguire, Wurdack & Maguire 42297*). a, habit, × 0.5; b, calyx spread apart, ×2.


a
b
c
d
18
d
b
c
21
a
c
d
e
a
f
19
a
b
c
g
20
b

FIGS. 18–21. *Raveniopsis.* FIG. 18. *R. tomentosa* (*Cardona 2663*). a, tip of fertile branchlet, × 0.5; b, dissected calyx, × 3; c, one hair, × 20; d, corolla, × 2. FIG. 19. *R. trifoliolata* ligulate. Disk undulate marginally, ca. 0.8 mm deep; style glabrous, ca. 20 mm long, ovary densely hispidulous.

Key to the Varieties of *Raveniopsis stelligera*

1. Mature calyx 3 mm long or shorter, the sepals plane, the larger ones not more than 2 mm wide, the smaller about 1.5 mm wide. Lateral leaflets acute. 2a. var. *stelligera.*
1. Mature calyx 4–5 mm long, some or all of the sepals reflexed at about the costa, the larger sepals broadly ovate, 4 mm wide, the smaller ones 2–2.5 mm wide. Lateral leaflets mostly rounded-obtuse, sometimes apiculate. 2b. var. *plicata.*

2a. Raveniopsis stelligera var. **stelligera.**

Galipea stelligera Cowan, Mem. N. Y. Bot. Gard. **8**:121 Apr 1953.

Endemic to the summit of Cerro Duida at about 1650 m elevation, in scrub forest on the banks of streams (type collection, *Maguire, Cowan & Wurdack 29653-A*).

2b. Raveniopsis stelligera var. **plicata** Cowan, var. nov.

A var. *stelligera* foliolis lateralibus rotundatis vel obtusis et apiculatis, 3 cm longis vel brevioribus, calyce 5 mm longo, lobis reflexis in costa, lato-ovatis vel plus minusve oblongis, acutis, lobis 2 maioribus 4 mm latis, late ovatis, 3 minoribus 2–2.5 mm latis, oblongis usque oblongo-lanceolatis, petalo adaxiali late ovato, ca. 3.5 mm longo et lato differt.

VENEZUELA: Amazonas: Cerro Coro-Coro, Serranía Yutaje, Río Manapiare, occasional in savannas and among rocks; alt. 1500 m; shrub 2–5 m high (sun form); fls coral red; 2 Mar 1953, *Bassett Maguire & Celia K. Maguire 35440* (Holotype, US No. 2253691). Same data and collectors *35262, 35277, 35302* (paratypes).

Endemic to the summit of Serranía Yutaje between 1300 and 2000 m elevation in woodland thickets and in open rocky savannas.

As is indicated in the varietal key, these varieties are separated principally by the differences in the proportions of the calyx in addition to a geographic disjunction; the plicate condition of the sepals is a striking difference separating var. *plicata* but it is not completely constant and hardly specific in importance. The difference in the shape of the adaxial petal in the two varieties is also worth noting, but it is mostly a matter of width.

When I originally described this species I included it in the genus *Galipea*, but it cannot belong there, as I presently interpret that genus, because of the form of the corolla and calyx. The sepals in individual flowers of material of the typical variety are not so dissimilar as they are in var. *plicata* and, for that matter, in most of the species of *Raveniopsis* and at the time of the original description of this species I ignored the small differences.

This species is one of three with the stellate type of pubescence; in this one and in *R. tomentosa* the hairs are dendroid-stellate. The branches of the hairs are more or less equally distributed along a main axis in that species; in *R. stelligera* the branches are rather closely aggregated on the lower part of the main axis and the greater part of the axis is naked of branches and drawn out

---

(*Maguire, Wurdack & Maguire 42217.*) a, habit, × 0.5; b, calyx and gynoecium, × 2; c, corolla and androecium, × 2. FIG. 20. *R. stelligera.* a–c, var. *stelligera;* a, calyx, × 3; b, corolla, × 1; c, one hair, × 20; d–g, var. *plicata;* d, habit, × 0.5; e, mature calyx, × 3; f, gynoecium, × 3; g, corolla, × 1. FIG. 21. *R. ruellioides. a–b, var. ruellioides* (*Maguire et al. 42447*); a, habit, × 0.5; b, calyx, × 2; c–d, var. *angusta* (*Maguire et al. 42189*); c, habit, × 0.5; d, calyx, × 2.

into a sharp, rather rigid point. This similarity in pubescence types and the form of the corolla limb suggests relationship with *R. tomentosa,* but in general habit *R. stelligera* is nearer *R. trifoliolata*, a species which is very different in the inflorescence, calyx, and type of pubescence.

3. Raveniopsis ruellioides (Oliver) Cowan, comb. nov.

Ravenia ruellioides Oliver, Timehri **5**:191. 1886.

Key to Varieties of *Raveniopsis ruellioides*

1. Leaves oval to elliptic, about 2–3 times as long as wide, the base subobtuse to acute, not attenuate-cuneate. Sepals ovate to broadly ovate. 3a. var. *ruellioides.*
1. Leaves narrowly elliptic, about 3.5–4 times as long as wide, the base long-attenuate-cuneate. Sepals narrowly lanceolate. 3b. var. *angusta.*

3a. Raveniopsis ruellioides var. **ruellioides.** Fig. 21.

Ravenia ruellioides Oliver, Timehri **5**:191. 1886.
Ravenia tatei Gleason, Bull. Torrey Club **58**:376. Jun 1931.
Ravenia ruellioides var. *ptariana* Steyermark, Fieldiana Bot. **28**:273. Dec 1952.

Widely distributed on the summits of sandstone tepuis from southernmost Venezuela to Mt. Roraima at 1500–2500 m elevation, in thickets and low scrub forest, especially along streams.

VENEZUELA: Amazonas: Cerro Sipapo, *Maguire & Politi 28095, 28211, 28271, 28459, 28667;* Cerro Duida, alt. 1825–2000 m, *Steyermark 58114* (NY), *Tate 436* (NY); Cerro de la Neblina, alt. 1900–2100 m, *Maguire et al. 42281* (US), *42447* (US). Bolívar: Mt. Roraima, alt. 2000–2500 m, *Im Thurn 211* (isotype US), *Irwin 428* (US), *Pinkus 141* (G, NY, US), *Steyermark 58715* (G, NY); Ilu-tepuí, *Maguire 33459* (US); Cerro Apacará, *Cardona 1544* (US); Auyán-tepuí, *Tate 1184* (NY, US); Ptari-tepuí, *Maguire & Wurdack 33891* (US), *Steyermark 59511* (NY); Cerro Guaiquinima, *Maguire 32941* (US), *32964* (US), *33088* (US); Chimantá Massif, *Steyermark 74893* (NY), *Steyermark & Wurdack 393* (NY, US), *Wurdack 34066, 34166* (NY, US).

3b. Raveniopsis ruellioides var. **angusta** Cowan, var. nov. Fig. 21.

A var. *ruellioide* foliis anguste ellipticis, ca. 3.5–4-plo longioribus quam latis, ad basim longe attenuato-cuneatis; sepalis anguste lanceolatis differt.

VENEZUELA: Amazonas: Cerro de la Neblina, rocky beaches along banks of Cañon Grande east of Cumbre Camp, alt. 1100 m; locally frequent shrub 0.3–1.5 m tall; fls red; 24 Nov. 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42189* (holotype, US No. 2267439). Same data and collectors *42495* (paratype, US).

The varietal key presents the characteristics that distinguish the two varieties. Among the materials of this highly variable species there are several forms, some of which have received names, but most of such variants are too inconstant to justify their recognition nomenclaturally. In the face of such a situation it may seem inadvisable to describe a new variety but it is sufficiently well separated morphologically and ecologically from the typical population that such a course cannot be satisfactorily avoided.

R. ruellioides is perhaps nearest *R. sericea* and *R. fraterna* but it differs from these, as well as from other species of the genus, by its pilosulose style, by the distribution of the pubescence on the leaves, and by the color of the corolla.

4. Raveniopsis sericea Cowan, sp. nov. Fig. 12.

Arbusculae 0.5–2 m altae, ramulis dense flavo-sericeis. Folia simplicia, rigido-coriacea, petiolis 3–6 mm longis, flavo-sericeis; laminae 28–40 mm longae, 17–30 mm latae; late ellipticae, elliptico-ovatae vel ovatae, ad apicem obtusae, ad basem rotundo-obtusae, pilosae sed glabrescentes supra (pilis suberectis

usque ad subappressos), infra dense flavo-sericeae, ad marginem valde revolutae, costa venis primariisque conspicue impressis supra, infra valde salientibus. Inflorescentiae cymiformes, terminales, flavo-sericeae, pedunculo 20–35 mm longo, flavo-sericeo, pedunculi apice unum florem terminalem et duos ramos racemiformes ca. 10–20 mm longos ferenti. Calyx dense sericeus, sepalis 2, late ellipticis, acutis, 3–3.5 mm longis, 2–3 mm latis, sepalis ceteris linearibus, 2.5–3 mm longis, 0.5–0.7 mm latis. Corolla sericea extus, intus in fauce minute lanulosa, tubulari-infundibuliformis, tubo 5.5 mm longo, lobis inaequalibus, ca. 3 mm longis, 1–2 mm latis, anguste oblongis et anguste ovatis. Stamina fertilia 2, filamentis ligulatis, 0.5 mm. longis, glabris, antheris oblongis, 1.2 mm longis, flabellato-appendiculatis, staminodiis 4, linearibus, pilosis. Stylus 2.5 mm longus, glaber; ovarium quinquelobatum, disco cupulari immerso. Fructorum cocci, sericei, oblique ovati, ca. 4 mm longi, 3 mm lati; semen papillatum, nigrum, ca. reniforme, 2 mm longum.

VENEZUELA: Bolívar: northwest cumbres, Churi-tepuí (Muru-tepuí), frequent in lower part of lower cumbre, alt. 2100–2200 m; shrub 0.5-2 m; corolla very light pink, with a pink stripe centrally outside on each lobe; 24 Jan 1953, *John J. Wurdack 34180* (holotype, NY); same locality and collector, alt. 2300–2500 m, *34297* (paratype, NY, US).

The nearest relative of this species is *R. fraterna*, which differs in having a longer corolla tube and sepals of a different shape, and the pubescence on the under surfaces of the leaves is different. *R. paruana* is another, more distant, relative; it differs in having bright orange-red flowers which are borne singly at the tips of the sprawling branches; the type and distribution of the pubescence are also distinctive.

5. **Raveniopsis fraterna** Cowan, sp. nov. Fig. 13.

Arbusculae 1–1.5 m altae, ramulis dense tomentosis. Folia simplicia, rigida, petiolis 2–3 mm longis, tomentosis; laminae 20–28 mm longae, 10–17 mm latae, ellipticae usque ad ovales, obtusae ad apicem basemque, longo-pilosae sed mox glabrescentes supra, infra dense tomentosae, ad marginem valde revolutae, costa venis primariisque valdissime impressis supra, infra valde salientibus. Inflorescentiae terminales, racemosae, pedunculo 6–20 mm longo, tomentoso. Calyx tomentosus usque ad sericeo-tomentosum, 2 sepalis oblanceolatis usque ellipticis, acutis, 5.5 mm longis, 3 mm latis, sepalis ceteris lanceolato-linearibus, 5 mm longis, 0.8 mm latis. Corolla tomentella extus, intus in fauce puberula, tubulari-infundibuliformis, tubo 9 mm longo, lobis inaequalibus, 3–4.5 mm longis, 2–4 mm latis, oblongis vel suborbicularibus. Stamina fertilia 2, antheris oblongis, 1.5 mm longis, appendicibus flabellatis, 0.5 mm longis, staminodiis 5, basilariter pilosulis, ca. 2 mm longis, linearibus. Stylus 8 mm longus, glaber; ovarium quinquelobatum, in disco cupulari inclusum. Fructorum cocci pilosa ad apicem, 4.5 mm longi, ca. oblongi; semen echinato-papillatum, fuscum, oblongum 3 mm longum.

VENEZUELA: Bolívar: Torono-tepuí, Chimantá Massif, summit at edge of escarpment in and among *zanjones*, alt. 2165–2180 m; shrub 1–1.2 m, locally frequent; lvs spreading, subcoriaceous, revolute, dark green above with sulcate veins, grayish-buff below with elevated veins; calyx dull green; corolla tube whitish with dull lilac, the lobes white inside and flushed pale lilac outside; 9 Feb 1955, *J. A. Steyermark & J. J. Wurdack 646* (holotype, NY); Central Section, Chimantá Massif, open forest on laterite deposit above swamp following east branch of headwaters of Río Tirica, alt. 2150–2200 m, 12 Feb 1955, *Steyermark & Wurdack 811* (paratype, NY, US); Chimantá Massif, along edge of ridge at summit of east-central portion of summit of Apacara-tepuí, alt. 2450–2500 m, 21–22 Jun 1953, *Steyermark 75905* (paratype, NY).

R. fraterna is most nearly related to *R. sericea;* the differently shaped sepals, the longer corolla tube, and the pubescence on the under surfaces of the leaves of *R. fraterna* are distinguishing characteristics. In this latter characteristic there is not complete uniformity; the type collection has the leaves distinctly and densely tomentose, the hairs rather flexuous, but the paratype collections show this feature less strikingly and in some examples the hairs are even more or less appressed. The flower parts are, however, quite consistently unlike in the two species.

6. Raveniopsis abyssicola Cowan, sp. nov. Fig. 11.

Arbuscula 2–3 m alta, ramulis pilosis, rubicundis. Petioli graciles, subappresso-strigosi, 5–14 mm longi, foliis simplicibus; foliorum laminae coriaceae, discoloratae, infra pallidiores, ellipticae, ad basem attenuato-cuneatae, apicaliter acutae, ad marginem angusto-revolutae et ciliatae, 6.5–9 cm longae, 2–3.5 cm latae, supra glabrae (pilosa costa excepta), infra pilosae, costa et venulis planis supra, infra salientibus, venulis ca. 20-jugatis, in vena marginali conjugentibus. Inflorescentiae axillares, dichasiales, 6.5–7 cm longae, axe piloso, pedunculo 4 cm longo, bracteis caducis, 1.5–2.5 mm longis, anguste ellipticis; pedicelli 1.5–2.5 mm longi, strigosi. Sepala glabra intus, subappresso-strigosa extus, acuta, duo exteriora 6–8 mm longa, 2–2.5 mm lata, anguste elliptico-oblonga, duo interiora 4 mm longa, 1.25 mm lata, sepalo quinto 4 mm longo, 0.5 mm lato, lineari. Corolla alba, sericea valde et subabrupte curvata, tubo 11–12 mm longo, 1.5 mm diametro ad basem, apicaliter ca. 4 mm diametro, lobis 5–7 mm longis, 1.25–2.5 mm latis, obtuso-acutis. Stamina fertilia 2 adaxialia, filamentis 7.5 mm longis, ligulatis, sericeis ad apicem, tubo cum staminodiis conjunctis, antheris anguste oblongis, sericeis, ca. 1.5 mm longis et 0.7 mm latis, connectivo in subulatum mucronem ca. 1 mm longo producto, antherarum basi biappendiculata, appendicibus parvis, ca. 0.3–0.6 mm longis, staminodiis ligulatis, ca. 13 mm longis, plus minusve villoso sericeis. Discus cupularis, haud crassus, 0.7 mm altus; ovarium ca. 0.9 mm altum, sparse pilosulum. Fructorum cocci cornuti, 6–7 mm longi, 3 mm lati, ovati, mucronati, sparse pilosuli; semina subreniformia, 3–3.5 mm longa, 1.5–2 mm lata, fulva, verruculosa ad minute muricata.

VENEZUELA: Amazonas: Cerro de la Neblina, occasional in bottom of Cañon Grande ssw of Cumbre Camp, alt. 1050–1100 m; shrub 2–3 m; fls white; fruit green; 25 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42504* (holotype, US No. 2267451).

The specific epithet for this remarkable species is chosen to emphasize its habitat preference—the bottom of the nearly mile-deep cañon on Cerro de la Neblina.

Several striking distinctions combine to separate *R. abyssicola* from all the other species of the genus: (1) the corolla is decidedly more zygomorphic than that of any of the others; (2) the fertile anthers have very small, hardly noticeable appendages at the base and unlike those of any of the other species are tipped by the elongate connective. There are also abundant vegetative characteristics to distinguish the species.

7. Raveniopsis paruana (Cowan) Cowan, comb. nov. Fig. 15.

Ravenia paruana Cowan, Mem. N. Y. Bot. Gard. 8:122. Apr 1953.

VENEZUELA: Amazonas: summit of Cerro Parú, Serranía Parú, Feb 1951, *Cowan & Wurdack 31285* (type collection).

Apparently endemic to Cerro Parú, growing in thickets in rocky scrub-savanna.

The solitary flowers of this species separate it from all others in the genus; the strongly hispid character of the vegetative parts is also distinctive.

8. **Raveniopsis linearis** (Gleason) Cowan, comb. nov. Fig. 14.

Ravenia linearis Gleason, Bull. Torrey Club 58:375. Jun 1931.

VENEZUELA: Summit of Mount Duida, alt. 1050–1657 m, Dec 1929, *G. H. H. Tate 531* (type collection); same locality, *Steyermark 58133* (NY), *58212* (NY).

Endemic to Cerro Duida, at 1050–1675 m elevation, along the banks of streams.

This is by far the smallest-flowered species, and the size and shape of the leaves furnish further distinguishing characteristics.

9. **Raveniopsis tomentosa** Gleason, Brittonia **3**:167. Oct 1939. Fig. 18.

VENEZUELA: Bolívar: Auyán-tepuí, alt. 2200 m, *G. H. H. Tate 1362* (type collection, NY); same locality, *Cardona 2663* (NY, US).

Apparently endemic to Auyán-tepuí, Venezuela.

The pubescence of this species is dendroid-stellate with the branches more or less evenly distributed along the main axis of the hair. In respect to pubescence at least, *R. peduncularis* is the closest relative; in that species the central axis of the hairs is not developed and a stalked, many-armed, star-shaped form results. The form of the inflorescence and flower parts, as well as vegetative differences, separates the two species.

10. **Raveniopsis peduncularis** Pittier & Lasser, Bol. Soc. Venez. Ci. Nat. **9**:121. 1944. Fig. 16.

Shrub 1–3 m tall, the branchlets densely and darkly rusty-brown-stellate-pubescent. Leaves simple, rigid, strongly discolorous, the petioles stout, 4–10 mm long, densely brown-stellate-pubescent, the blades (3.5–)5.5–8.5 cm long, (1.5–)2–4.5 cm wide, elliptic to ovate to narrowly ovate, obtuse basally, the apex acute, often with a mucro to 2 mm long, the upper surface at first densely grayish-stellate-pubescent but soon glabrescent and then nitid and distinctly green when fresh, the lower surface densely rusty-stellate-pubescent, the costa impressed above but strongly salient beneath, the venules plane and subobscure above, prominulous beneath. Inflorescences spicate, dichasial, densely rusty-stellate-pubescent, the peduncle arising in the upper axils, 2.5–4 cm long, the two unilateral branches to 5 cm long. Flowers orange-red, sessile, rusty-stellate-pubescent externally, the calyx densely so; sepals strongly unequal, obtuse, more or less joined very shortly at the base, the two largest 4 mm long, 1.5 mm wide, oblong-lanceolate, the remaining three sepals 2–3 mm long, ca. 1 mm wide, glabrous within except at the apices; corolla tube slightly arcuate, 8–11 mm long, villose within, the limb strongly unequal, the upper lip entire, 7 mm long, 2 mm wide, lanceolate, the lower lip 4-lobed, the lobes lanceolate-oblong, ca. 3.5 mm long, 1 mm wide. Filaments of the two fertile stamens 12 mm long, villose, the fertile anthers oblong, ca. 2 mm long, glabrous, the staminodia 10–13 mm long, villose. Disk shallowly cupulate, 0.6 mm deep, 1.5 mm in diameter, completely enclosing the glabrous ovary, the style glabrous, 7 mm long, tapering apically to the digitate stigma. Cocci of the fruit rusty-red-stellate-pubescent, venose, apiculate, ca. 3 mm long, 2 mm wide, the seed minutely verruculose, reniform, ca. 2 mm long, 1 mm wide, dark brown.

VENEZUELA: Bolívar: Cerro Guaiquinima, upper Río Paragua, Oct 1945, *Cardona 948* (type collection, NY, US); same locality, alt. 1740–1760 m, *Cardona 1089, Maguire 32754* (US), *32815, 32854, 32944, 32985, 33069.*

Endemic to Cerro Guaiquinima; frequent at 1600–1800 m elevation on or just below the summit in scrub thickets or rocky, exposed areas and in scrub-savannas.

In addition to the difference between the two types of stellate pubescence, this species differs from its nearest relative, *R. tomentosa,* in the type of inflorescence, as well as in many details of the flower and leaves. *R. peduncularis* is characterized by a dichasial inflorescence, the branches of which are unilaterally spicate; the inflorescence of *R. tomentosa* is a simple, unilateral spike, obviously a reduction of the dichasial arrangement of its relative.

11. **Raveniopsis nubicola** Cowan, sp. nov. Fig. 17.

Arbusculae 0.7–1.5 m altae, ramulis velutinis, foliis simplicibus. Petioli crassi, 7–12 mm longi, velutini; foliolorum laminae rigidae, valde discoloratae, ovales, obovatae, ellipticae vel late ellipticae, 37–83 mm longae, 20–38 mm latae, ad apicem obtusae et apiculatae, ad basim acutae, subobtusae vel obtusae, marginaliter valde revolutae, supra nitidae, glabrae (costa pilosa excepta), infra densissme luteo- vel cinnamomeo-tomentosae, costa impressa supra, infra valde salienti, venulis subobscure impresso-reticulatis supra, infra salientibus, 12–15-jugatis. Inflorescentiae dense spicatae, interdum binatae, usque ad 6 cm longas, densissime piloso-velutinae, pedunculo 10–17 mm longo, bracteis ca. 5 mm longis, anguste lanceolatis, acutis, persistentibus; flores sessiles, aurantiaco-rubri. Sepala crassa, densissime piloso-velutina, duobus maioribus 10 mm longis, 3 mm latis, obtusis, oblanceolatis, sepalis ceteris 6–7 mm longis, 1–1.5 mm latis, lanceolatis, acutis. Corolla curvata, extus pilosa in lineis, intus limbo glabro sed tubo tomentuloso, tubo ca. 10 mm longo, lobis 5.5–7.5 mm longis, plus minusve ellipticis, obtusis. Antherae 2.5 mm longae, anguste ellipticae, glabrae, dorsualiter sericeae, appendicibus 0.5 mm longis, filamentis 9 mm longis, anguste oblanceolatis, villosis. Discus 1 mm profundus, glaber, leviter crenulatus. Stylus 4 mm longus, glaber. Fructorum cocci usque ad 5, piloso-velutina, 4 mm longa, 3.5 mm lata, seminibus 3 mm longis, 2 mm latis, reniformibus, papillato-muricatis, nigris.

VENEZUELA: Amazonas: Summit of Cerro de la Neblina, Río Yatua, locally frequent in scrub forest 15–18 km sw of Cumbre Camp, alt. 2000 m; shrub 0.7–1.5 m; fls orange-red; 2 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42297* (holotype US No. 2267443).

This high-altitude representative of the genus is named for its seeming preference for the cloud-shrouded summit of Cerro de la Neblina. It is very surely most nearly related to *R. tomentosa* and *R. peduncularis*, more closely to the former than to the latter. *R. nubicola* differs in a number of characteristics: (1) its pubescence is simple, in contrast to the dendroid-stellate pubescence of its near relatives; (2) it has substantially longer petioles; (3) its sepals are differently shaped and also differ somewhat in size; (4) the corolla is red in the new species but white in its nearest relative; (5) the corolla lobes are longer and differently shaped in the new species.

Myllanthus Cowan, gen. nov. Fig. 22.

Arbor; folia opposita, trifoliolata. Inflorescentiae unilateraliter cincinnoideo-racemosae, cauliflorae vel ramuliflorae; flores pedicellati, hermaphroditi, sepalis liberis, petalis valde imbricatis, tubo inaequali conjunctis; stamina fertilia 2, antheris basim appendiculatis, dorsualiter in connectivo valde papillato-glandulatis, filamentis in tubo corolla cohaerentibus. Discus cupularis, quinquelobatus; stigmata quinquelobata; ovarium quinquepartitum, carpellis solum stylo conjunctis. Fructorum cocci monosperma, capsularia.

Type Species: *Myllanthus maroana* Cowan.

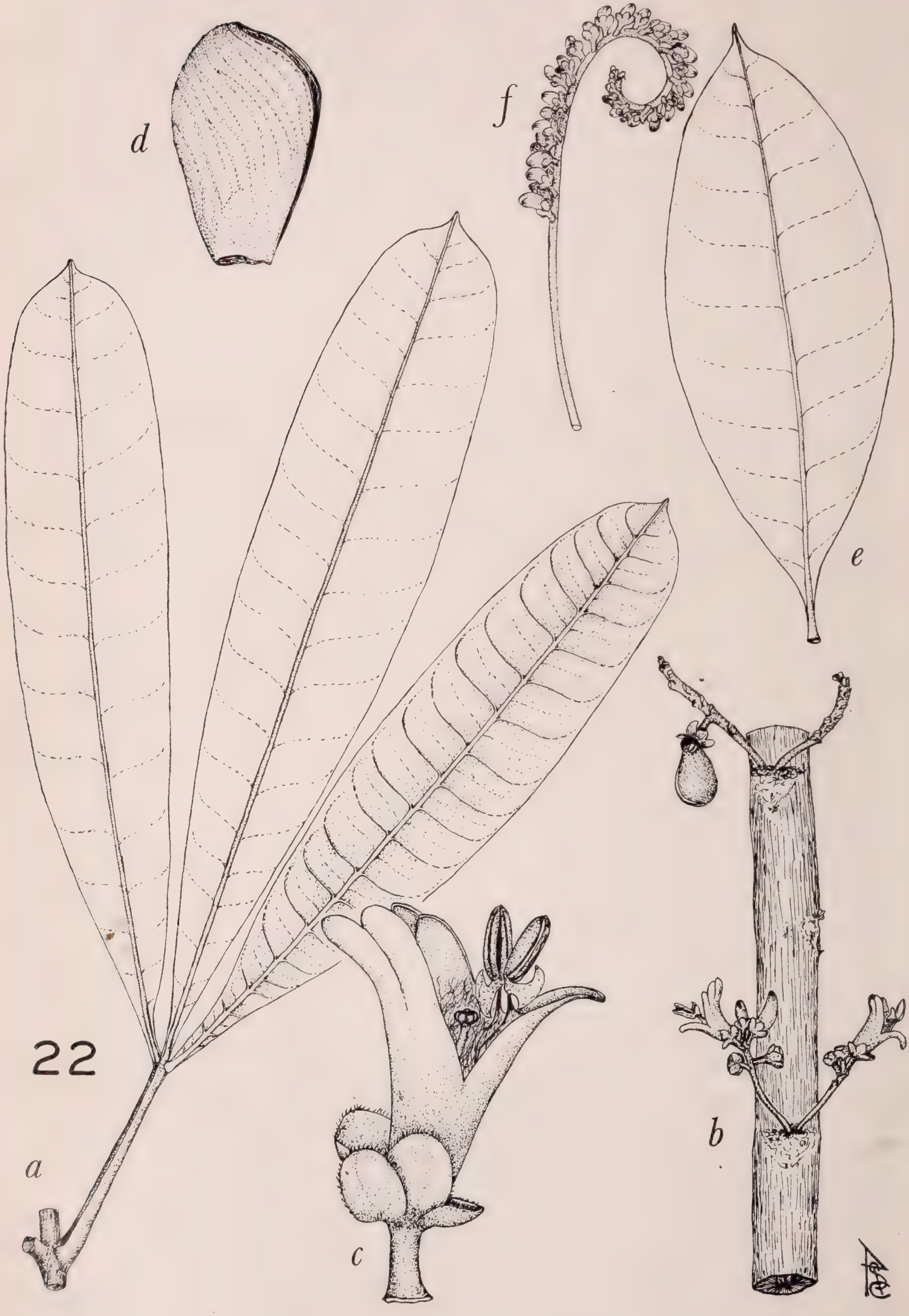
Myllanthus is properly associated phylogenetically with two genera, *Lubaria* and *Raputia*. All three genera are characterized by zygomorphic corollas; in most of the species the corolla is more or less arcuate, and this characteristic is the basis of the generic name of the new genus (μυλλός, myllos—bent; ἄνθος, anthos—flower). *Lubaria* is easily distinguished from the others by its free adaxial petal with the two fertile stamens on the adaxial side of the flower; the other two genera (*Myllanthus* and those species of *Raputia* with appendaged anthers and strongly arcuate corolla) have the abaxial petal more nearly free than the other petals (but distinctly joined with the others at least basally) and the two fertile stamens on the abaxial side of the flower. However, the basal appendages of the anthers are very different in the *Raputia* species, consisting of elongate, ligulate structures which are obviously the unmodified, sterile bases of the anther thecae. At least two species of *Raputia* have the arcuate corolla and the orientation of the androecium of *Myllanthus*, but in addition to the difference in the appendages, the calyx of the *Raputia* species is cupular with small teeth on the margin of the cup.

Key to the Species of *Myllanthus*

1. Leaflets oblong, three times as long as wide. Inflorescence 3–4 cm long, not obviously coiled. 1. *M. maroana.*
1. Leaflets elliptic, less than three times as long as wide. Inflorescence 10–18 cm long, obviously coiled. 2.
2. Leaflets with petiolules 1–2 cm long; petioles about 8 cm long. Flowers with pedicels 3–4 mm long. 2. *M. neblinae.*
2. Leaflets sessile; petioles 4 cm long or shorter. Flowers sessile or subsessile. 3. *M. ulei.*

1. **Myllanthus maroana** Cowan, sp. nov. Fig. 22, a–d.

Arbor 3–6 m alta, ramulis minute malpighiaceo-strigulosis sed mox glabrescentibus, foliis digitato-trifoliolatis. Petioli 10–12 cm longi, glabri, canaliculati, laminae sessiles, oblanceolatae usque ad oblanceolato-oblongas, coriaceae, discoloratae, infra pallidiores, glabrae et nigro-punctatae, 25–45 cm longae, 8–14 cm latae, acutae apicaliter, ad basim attenuato-cuneatae, costa salienti, venulis planis supra, infra salientibus. Inflorescentiae cauliflorae, 3–4 cm longae, unilateraliter cincinnoideo-racemosae, axe et floribus minute malpighiaceo-strigulosis, pedicellis 4–6 mm longis. Sepala 3–3.5 mm longa et lata, orbicularia vel suborbicularia, ciliolata; petala villosa intus, inaequaliter connata, petalo abaxiali in tubo ca. 4 mm connato, ejus lobo 15 mm longo, obtuso, petalis ceteris in labia quadrilobata, curvata ca. 11 mm longa connata, eorum lobis oblongis, leviter cucullatis, ad apicem rotundatis. Stamina 4 sed solum 2 fertilia, filamentis elongato-oblanceolatis, apicaliter subulatis, villosis; antherae fertiles oblongae, connectivo papillato-punctato, 5.5 mm longae, 1.5 mm latae, appendicibus late flabellatis, antherae apicem versus curvatis et papillato-glandularibus, ca. 2 mm longis et 4 mm latis. Discus carnosus, ca. 1 mm profundus; stylus 9 mm longus, glaber; ovarium glabrum, papillatum. Fructorum cocci oblongo-obovata, 17 mm longa, 10 mm lata, ad apicem dehiscentia; semina ca. 12 mm longa, 8 mm lata, ovali-oblonga.



22

VENEZUELA: Amazonas: occasional in high forest along trail to Guzman Blanco 1–5 km se of Maroa, Río Guainía, alt. 120–140 m; tree 3–8 m; cauliflorous; fls cream; 9 Oct 1957, *B. Maguire, John J. Wurdack & W. M. Keith 41780* (holotype, US No. 2267414); Selva de Maroa, Río Guainía, alt. 127 m, 17 Feb 1942, *L. Williams 14392* (paratype).

This species differs from *M. neblinensis,* its nearer relative, in size and shape of the leaflets, and in the length of inflorescence and the degree to which it coils; there are doubtless many good floral characteristics that separate the two species but the lack of mature flowers in *M. neblinensis* makes critical comparison impossible.

2. **Myllanthus neblinensis** Cowan, sp. nov. Fig. 22, e–f.

Arbor 5 m alta, ramulis petiolis petiolulisque minutissime malpighiaceo-strigulosis. Petioli 6.5–7.5 cm longi, petiolulis 1–2 cm longis, haud alatis; laminae chartaceo-coriaceae, plus minusve concoloratae, glabrae, 16–21 cm longae, 6–8 cm latae, ellipticae, ad apicem acutae, ad basim attenuato-cuneatae, costa salienti, venulis planis et inconspicuis supra, infra salientibus. Inflorescentiae scorpioideae, ca. 10 cm longae, axe et floribus minutissime malpighiaceo-strigulosis, pedunculo 20–27 mm longo, pedicellis 3–4 mm longis. Calyx ad basim truncatus, sepalis ciliolatis, rotundatis, 2.5 mm diametro, corolla androecium et gynoecium valde immaturis. Fructorum cocci oblonga, 10 mm longa, 7 mm lata, valde transverse costata, dense strigulosa.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, in talus forest between Camps 3 & 4, alt. 900–1000 m; tree 5 m; buds greenish; 8 Nov 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42001* (holotype, US No. 2267436).

Ordinarily this material would await description for further collections to be made but, since the slopes of Cerro de la Neblina are not likely to be visited again for a very long time, I have given this a name. It differs from its nearer relative, *M. maroana,* in leaf size and shape, and in characteristics of the inflorescence. The flowers are very immature but sufficiently developed to determine its affinity with this genus.

3. **Myllanthus ulei** (Krause) Cowan, comb. nov.

Cusparia ulei Krause, Repert. Sp. Nov. 2:26. Jan 1906.

BRAZIL: Amazonas: near Manaos, Ule *5382a* (type).

Lowlands near rivers in northwestern Brazil.

Near Santa Izabel, Rio Negro, *Ducke 339* (US); Manaos circa Cachoeira do Mindú, *Ducke 20478* (US).

There are perhaps other species of *Cusparia* which should be removed to other genera, but this one is certainly anomalous in the genus. The flowers are less strongly arcuate than those of *M. maroana,* but in characteristics of the calyx and inflorescence the relationship is quite clear.

M. ulei is most nearly related to *M. neblinensis* and differs in having sessile or nearly sessile flowers, and sessile leaflets on a relatively short petiole.

FIG. 22. *Myllanthus.* a–d, *M. maroana* (*Maguire, Wurdack & Keith 41780*). a, one leaf, × 0.25; b, portion of stem with ramiflorous inflorescences and infrutescences, × 0.5; c, flower at anthesis, × 2; d, one mature coccus of fruit, × 2; e–f, *M. neblinensis* (*Maguire, Wurdack & Maguire 42001*). e, leaflet, × 0.5; f, inflorescence with immature flowers, × 0.5.

APR. 1960 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN 10(2):38–57

THE MORPHOLOGY AND RELATIONSHIPS OF DIOMMA, GEN. INC. SED.

William L. Stern and George K. Brizicky
Samuel James Record Memorial Collection
School of Forestry, Yale University
New Haven, Connecticut

INTRODUCTION

In natural systems of plant classification, an attempt is made to arrange plants so that related taxa are near to one another. The bases upon which decisions are made concerning relationships among plants are various, and features that are important in some groups are relatively unimportant in other groups. It is now regarded of utmost importance in phylogenetic considerations to select not a single character upon which to found relationships among taxa, but to obtain information from as many pertinent fields of endeavor as possible, and to bring these data to bear upon problems in classification. This synthesizing of available information has been accomplished with more or less success for a number of taxa. Nevertheless, there are still many enigmatic, incompletely investigated groups which have remained in a state of taxonomic limbo affiliated at one time with one category and at other times with other categories. Such has been the case with *Diomma,* genus incertae sedis, noted by Engler from specimens collected by Ule in 1910, but actually published by Harms (1931a).

It was suggested recently by Dr. Bassett Maguire of The New York Botanical Garden, that a combined morphologic-taxonomic study of *Diomma* be made in an effort to determine its relationships. In the course of correspondence regarding specimens of *Diomma,* Dr. Richard S. Cowan of The United States National Herbarium recommended that we also investigate the genus *Sohnreyia* in this regard. Dr. Cowan remarked, that at least superficially *Diomma* and *Sohnreyia* appeared remarkably alike. At the present time descriptions of two species of *Diomma* appear in the literature, and it will remain to be shown whether these represent distinct taxa and also whether other species perhaps exist.

Diomma

Diomma ulei Engler ex Harms remained the only species until 1952, when Steyermark described a second species, *D. fruticosa. Diomma* comprises trees of striking appearance for dicotyledons. The unbranched trunk is surmounted by a crown of large pinnately compound leaves and the trees greatly resemble palms in habit. According to Maguire's field observations, at maturity the plants are crowned by a large compound paniculate inflorescence. Apparently the plants die after the fruits mature.

Harms (1931a) describes *Diomma ulei* as possessing large pinnately compound leaves. Flowers are white, regular, bisexual, 5-merous, and borne in short panicles (sic). The free stamens oppose the sepals, and are broadened at the base of the filament. The broad ovary is laterally compressed, 2- or rarely 3-locular, and borne on a broad, cushion-like, nectariferous base. Locules are uniovulate. Ovules are anatropous, and hang from the upper portion of the septum on a short, thick funiculus so that the raphe is dorsal and the micropyle inside (fig. 1A). This condition has been termed apotropy. Styles are 2, very short and stout, each terminated by a capitate stigmatic surface. Samaras are

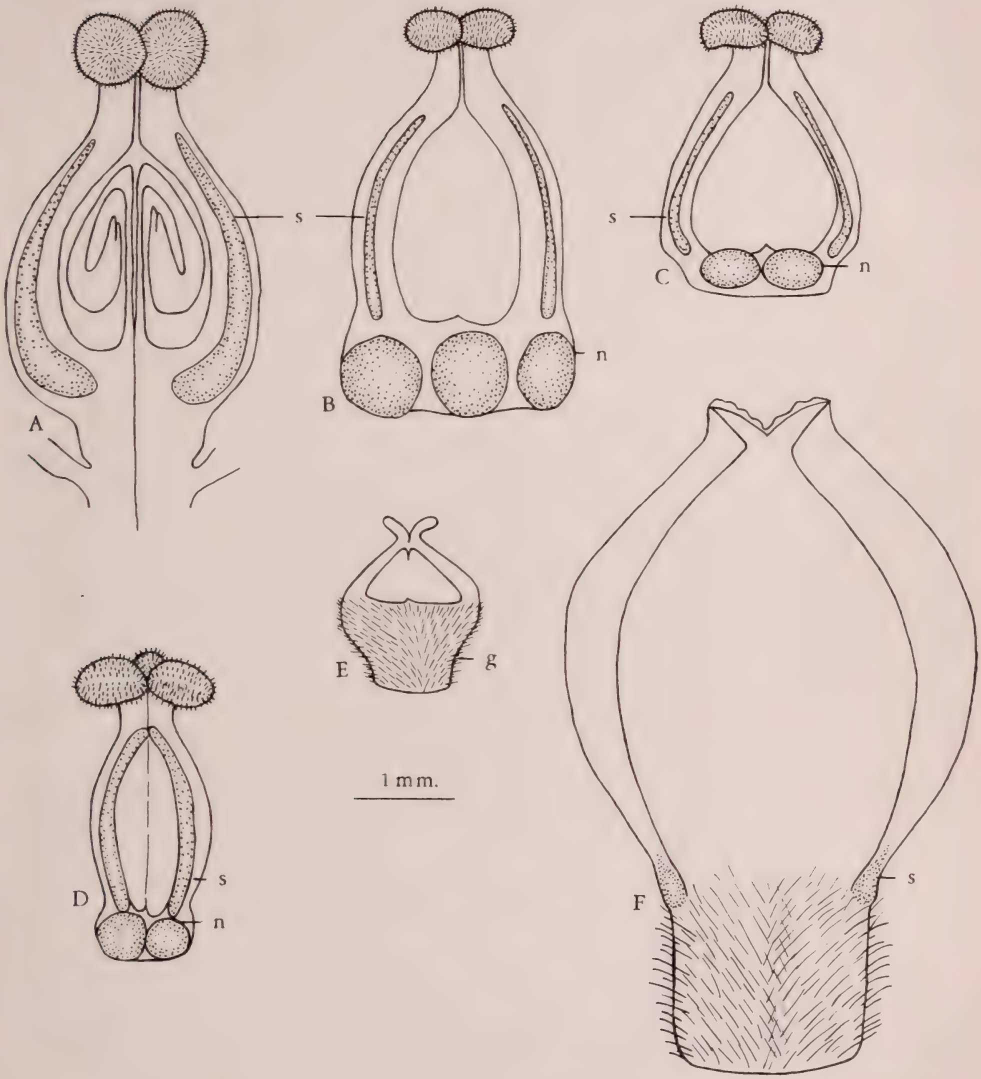


FIG. 1. A, *Diomma* species A, pistil from female flower to illustrate position of secretory cavities *s* and the apotropous orientation of the ovules as seen in cleared preparations. B, *D. ulei*, pistil from female flower to show position of secretory cavities *s* and nectaries *n*. C, *Diomma* species A, pistil from female flower to illustrate shape (cf. A), position of secretory cavities *s* and presence of nectaries *n*. D, *Spathelia subintegra*, pistil from female flower to demonstrate the tricarpellate nature of the ovary, presence of secretory cavities *s*, and nectaries *n*. E, *Diomma* species A, pistil from male flower showing a reduced ovary supported by a gynophore *g*. F, *Sohnreyia excelsa*, young fruit showing secretory cavities *s* and conspicuous gynophore. Notice also the beginnings of wings and the peculiar apical protuberance. All drawings diagrammatic.

2, rarely 3, winged, flattened, broadly ovate, rounded at the base, and attenuated at the tip into a bifid apiculum. Seeds lack endosperm and have a straight embryo. Harms (1931b) added that he did not observe any resin canals, that the bark and leaves were weakly bitter, and that tufted hairs occurred on the edges of sepals and petals. Steyermark's (1952) description of *D. fruticosa*, based on non-flowering material, is essentially the same as that for the genus as given by Harms (1931a), but he mentioned the occurrence of punctae in the leaves. The geographic distribution of *Diomma* appears to be restricted to the Roraima sediments of the Guayana region of north-central South America.

Ule (1914), in describing the vegetation of Roraima, mentioned ". . . eine merkwürdige neue Gattung der Simarubaceen, *Diomma Ulei* Engl." Harms (1931a), in validating Engler's description of this species, remarked that the position of *Diomma* is uncertain. He stated that the apotropous ovules differ from those of genuine Simaroubaceae and from those of the Geraniales as a whole. However, he placed it under *Simaroubaceae* because Engler had considered it under that family. Nevertheless, later in 1931, Harms delved further into the relationships of *Diomma* and averred that the apotropous ovules suggested an alliance with *Sapindales*, but that a close relation in this order would be difficult to find. *Diomma* was placed in the simaroubaceous tribe *Picramnoideae* next to *Alvaradoa* by Cronquist (1945). Steyermark (1952) mentioned that, "The large leaf-scars and long-pinnate leaves of this genus resemble some genera, such as *Ailanthus*, of the Simarubaceae . . . but the punctate leaves of *D. fruticosa* may show a closer affinity or connection with Rutaceae, to which family it is here assigned."

Sohnreyia.

The genus *Sohnreyia* is represented by a single species, *S. excelsa*, which was described by Krause (1914) from specimens gathered by Ule. *Sohnreyia* like *Diomma*, is one of those dicotyledons with a palm-like habit. Krause describes this plant as an erect, palm-like tree with a slender unbranched trunk bearing very large pinnate leaves crowded at the apex. Also, like *Diomma*, *Sohnreyia* is a species which blooms and fruits but once at the termination of its existence (Krause 1921; Ducke 1930).

Krause (1914) notes that the large, pinnately compound leaves of *Sohnreyia* are glandular-punctate. Flowers are white, regular, polygamous, 5-merous, and disposed in loose, many-flowered panicles. The free stamens are inserted at the base of a gynophore opposite the sepals. In the female and bisexual flowers, stamens are smaller than in the male flowers. The filaments are provided with a wing-like, bifid appendage in the lower part. The 2-locular ovary is inserted on a thick, subcylindrical gynophore. Ovaries are small, rudimentary, and estigmatose in male flowers, but in female and bisexual flowers the ovaries are larger, somewhat laterally compressed, and in females bear a short style terminated by a fairly large, bilobed, discoid stigma. Ovules are pendulous, anatropous, and solitary in each locule of the ovary. Krause did not see fully developed fruits. However, in 1922, Ducke described the fruits of *Sohnreyia* as resembling the samaras of certain *Combretaceae*, e.g., *Terminalia argentea*. However, he noted that the fruits of *Sohnreyia* were 2-seeded, dry, and with 2 membranous confluent wings which are conspicuously reticulate. According to Ducke and Black (1953), *Sohnreyia excelsa* is scattered in Brazil on uplands from Manáus to the lower part of the Trombetas River north of the Amazon River, and south of the Amazon River from Jurutí Velho and Maués to the northern part of the Mato Grosso and the Territory of Guaporé.

Krause (1914) placed *Sohnreyia* in the *Rutaceae*, in an isolated position, mentioning that it could be related to *Dictyoloma*, but lacking mature fruits no definite association could be made. Engler (1931) agreed with Krause regarding the definitely rutaceous nature of *Sohnreyia* and erected a special monotypic subtribe *Sohnreyiinae* under the tribe *Toddalieae* of the subfamily *Toddalioideae* to contain this genus.

METHODS AND MATERIALS

The investigation undertaken herein depended upon an examination of several kinds of materials, some by more than one method. Most material was in dry form, but some formalin–acetic-acid–alcohol preserved material was also available for study. Nodal regions and vasculation of petioles in *Diomma* were examined using a supersaturated solution of phloroglucin in water to demonstrate the presence of lignin. Freehand serial sections were cut directly into the phloroglucin solution, mounted on a slide, and 2 or 3 drops of concentrated HCl applied directly to the section. The appearance of a red-violet color indicated the presence of lignin (vascular tissue). Secretory structures, in leaves of various specimens examined, were demonstrated by the use of small portions of leaflets cleared by treatment with 3 per cent NaOH at 40°C. Subsequently to washing with water, cleared leaves were stained in safranin, dehydrated, treated with toluene, and mounted on slides in Canada balsam. This same method was employed with pistils and other floral parts. Leaves were also embedded in paraffin, sectioned transversely and paradermally, stained in Heidenhain's iron-alum haematoxylin and safranin, and mounted on slides in balsam. Wood specimens were prepared for microscopic examination in the conventional way. Small blocks were boiled in water to exclude air and soften, after which they were dehydrated and embedded in celloidin. After being cut on a sliding microtome, sections were stained in Heidenhain's iron-alum haematoxylin and safranin and mounted on slides in balsam. Maceration of wood was accomplished by Jeffrey's method as outlined by Johansen (1940). Macerated wood was stained in safranin, dehydrated with tertiary-butyl alcohol, and infiltrated with Canada balsam before being mounted on slides. Studies of floral morphology were based largely on boiled flowers from herbarium specimens. Some preserved flowers were also at hand.

Terminology used in the section on xylem anatomy follows that recommended by the Committee on Nomenclature of the International Association of Wood Anatomists (1957). Terms referring to cell size are taken from Chattaway (1932). Measurements of vessel element and fiber-tracheid length and tangential pore diameter are based on 50 samples each. Only the means and ranges for these measurements are presented because the small number of specimens at our disposal would make meaningless any more detailed treatment of the data (Stern & Greene 1958).

Specimens examined: *Diomma ulei* Engler ex Harms: *E. Ule 8646* (Type, G; Isotype, L, K); *J. A. Steyermark 58982* (F, NY), *59798* (F). *D. fruticosa* Steyermark: *J. A. Steyermark 60820* (Type F sterile), *60327* (''Co-type'' F fruits); *T. Lasser 1786* (US); *B. Maguire & J. J. Wurdack 33808* (NY). *Diomma* species A: *J. A. Steyermark 75699* (NY):

J. A. Steyermark & J. J. Wurdack 938 (US), *1099* (NY). *Diomma* species B: *B. Maguire, J. J. Wurdack & C. Maguire 42329* (US, Y), *42315* (US, Y).

Sohnreyia excelsa Krause: *A. Ducke 8* (Y), *1180* (US, Y), *s. n.* (US, MG 15702), *s. n.* (US, RB 20472).

Wood specimens were available of *Diomma* species B, *B. Maguire, J. J. Wurdack & C. Maguire 42315*, and of *Sohnreyia excelsa, A. Ducke 8.* Preserved material of *Diomma* was available as follows: fruits and petiole portions, *B. Maguire, J. J. Wurdack & C. Maguire 42329;* flowers, leaf and petiole portions, *B. Maguire, J. J. Wurdack & C. Maguire 42315;* flower buds, *J. A. Steyermark & J. J. Wurdack 1099.*

GENERAL MORPHOLOGY

In the course of our investigations several new structural features and arrangements of sex in *Diomma* and *Sohnreyia* have come to light. Because we probably have had more specimens for study than had Harms, Engler, or Krause, it is possible to show certain heretofore unreported characteristics to good advantage. For the sake of the discussions which follow, it is of importance to set down these additions to the knowledge of the genera in question.

Diomma.

1. All species of *Diomma* apparently are polygamous. However, because of the relative paucity of flowering material, the kinds of flowers that occur in the different species are uncertain. In *D. ulei* only female flowers were found; in *D. fruticosa* and *Diomma* species B, only male flowers were seen. In *Diomma* species A, both male and female flowers were observed in the same inflorescence.

2. Sepals, and often petals, are provided with a tiny glandular cavity at their apices.

3. The filaments of stamens in species of *Diomma* possess 2 lateral, wing-like expansions (appendages?) in the lower half (fig. 2A–D). These have free, ciliate, dentiform tips and are usually densely villous on the inner surface. Unfortunately, only female flowers of *D. ulei* were on hand, and the staminal filaments (stamens here are apparently non-functional) here did not possess distinct wing-like portions. However, the bases of the filaments were more or less slightly broadened and ciliate (fig. 2A, B).

4. Ovaries of female flowers (fig. 1) are subsessile and are situated on a tiny pedestal or rudimentary gynophore. This pedestal bears 5, unequally large, cushion-like swellings. These are sometimes more or less confluent and apparently are nectariferous. A single very short style which terminates in 2 large, discoid to subcapitate stigmatic lobes is present. The stigmata are fleshy and papillose, and may be coherent or actually connate so as to produce a single, deeply bilobed structure. Stamens are somewhat shorter in female than in male flowers. Male flowers possess pistils with reduced ovaries and rudimentary stigmata. Interestingly, in these flowers, the ovarian pedestal, which is inconspicuous in female flowers, forms a more or less conspicuous, broad gynophore.

5. Within the dorsal wall of each carpel there is an elongate secretory cavity, narrow at the apex and more or less bulbous at the base, which is filled with yellowish contents (fig. 1A–C).

There has been some doubt cast on the presence of certain characters in *Diomma* upon which we can now elaborate. For example, there is no question that the pendulous ovules of *Diomma* are indeed apotropous, that the raphe is dorsal, and that the micropyle is directed upward (fig. 1A).

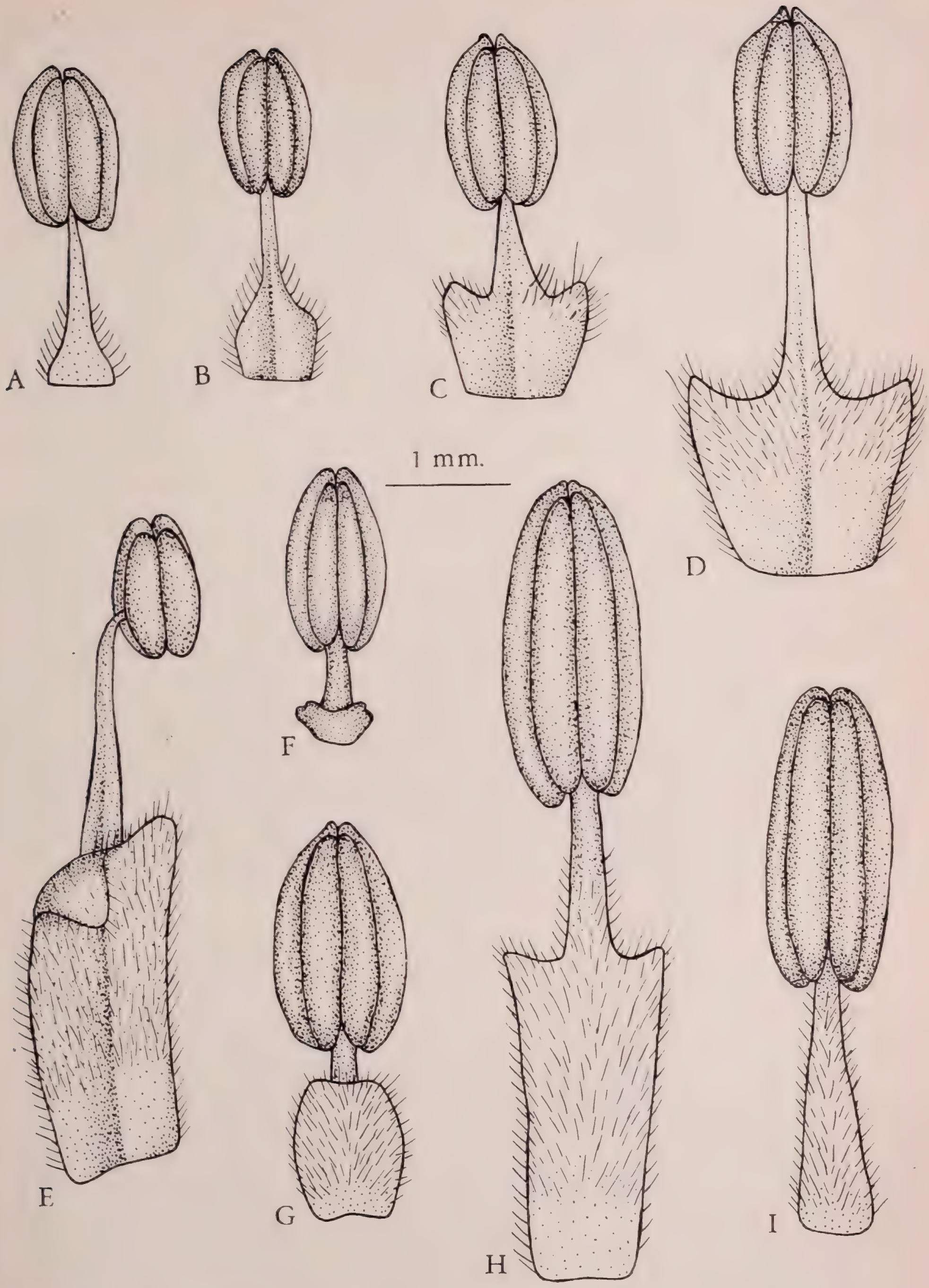


FIG. 2. A–D, *Diomma* spp., stamens to illustrate nature of staminal appendages. A, B, *D. ulei* from female flower. C, *Diomma* species A, from female flower. D, *Diomma* species B, from male flower. E, *Sohnreyia excelsa* stamen showing structure and orientation of ala as compared with those in *Diomma*, A–D, and *Spathelia*, F–I. F–I, *Spathelia* spp. showing variable nature of staminal alae in this genus. F, *S. cubensis* from male flower. G, *S. subintegra* from female flower. H, *S. simplex* from male flower. I, *S. glabrescens* from male flower. All drawings diagrammatic.

Ule, collector of the type of *Diomma*, did not mention its palm-like appearance. The only report in the literature of this characteristic is in Steyermark's description of *D. fruticosa*. However, field notes associated with the following collections also make note of the palm-like nature of *Diomma: D. ulei, J. A. Steyermark 59798; D. fruticosa, T. Lasser 1786, B. Maguire & J. J. Wurdack 33808; Diomma* species A, *J. A. Steyermark 75699, J. A. Steyermark & J. J. Wurdack 938*.

Monocarpy, that is, the condition in which death of a plant follows closely after a single flowering and fruiting cycle, has only been noted once for *Diomma* —in the field notes accompanying *B. Maguire & J. J. Wurdack 33808, D. fruticosa*. More recently, in correspondence, Maguire has supplied the following clarification: "Apparently the tree does not survive flowering and fruiting, and dies after the fruits have become mature." Further indirect evidence is obtainable in the field notes of *T. Lasser 1786* that the inflorescence is terminal, and in *J. A. Steyermark 75699* that the tree is common in the sterile condition.

Sohnreyia.

1. Ovules in *Sohnreyia* are apotropous, the raphe is dorsal, and the micropyle is directed upward.

2. The locules of ovaries and young fruits are pubescent inside and possess unicellular trichomes.

3. Sepals are provided with tiny glandular cavities at their apices.

4. Ovaries and young fruits are characterized by the presence of 2 dorsal, elongate, sac-like secretory structures, one in each carpel wall.

5. In *Sohnreyia*, staminal filaments (fig. 2E) possess wing-like processes at their bases. These processes appear to be fused with the ventra of the filaments for most of their length, their bifid apices being free and ligular and projected ovary-ward. The actual nature of staminal processes here, and the expansions of the filaments in *Diomma*, cannot be stated with certainty without more detailed anatomical studies.

NODE AND PETIOLE

Although a number of specimens of *Diomma* were available for study, only one, *D. ulei, J. A. Steyermark 58982*, proved to be more or less suitable for anatomical study. Difficulty is encountered in interpretation of the vascular structure of the stem tip because of the crowded insertion of the leaves and correspondingly telescoped internodal regions. However, it can be seen that *Diomma* has multilacunar nodes with probably 9–15 traces entering the base of the petiole (*D. ulei*–9, 11; *Diomma* species A, *J. A. Steyermark 75699*–13, 15). Trace number may even vary in a single specimen. The vascular tissue in the petiole was traced from the point of attachment to the stem, the lower pulvinus, to the insertion of the first pair of leaflets, the upper pulvinus. In the first 10 or 12 mm of petiolar tissue, the originally discrete vascular strands fuse (fig. 3B). The resulting vascular cylinder is deeply notched adaxially and corresponds to the adaxial invagination toward the base of the petiole. Distally, the cylinder becomes almost circular in transverse section and is only shallowly notched above. This is true even though the petiole appears quite circular externally in this area. Lignification and hardening of the vascular cylinder seem to proceed from the abaxial to the adaxial regions. It may also be of importance to note the formation of a sclerenchymatous zone exterior to (part of ?) the phloem and becoming visible 6 or 8 mm distal to the petiolar attachment. This zone first develops in the abaxial region as an arc of sclerenchyma, and as one proceeds distally, the arc extends until it surrounds the vascular cylinder. No medullary vascular bundles were observed in the pith of the petiole of *Diomma.*

SECRETORY STRUCTURES

Secretory structures in the tissues of plants can be divided into two general categories: (1) the secretory cell which is idioblastic in nature and is not contiguous with other such cells, and (2) the secretory intercellular space which is surrounded by a continuous layer of cells composing a secretory epithelium.

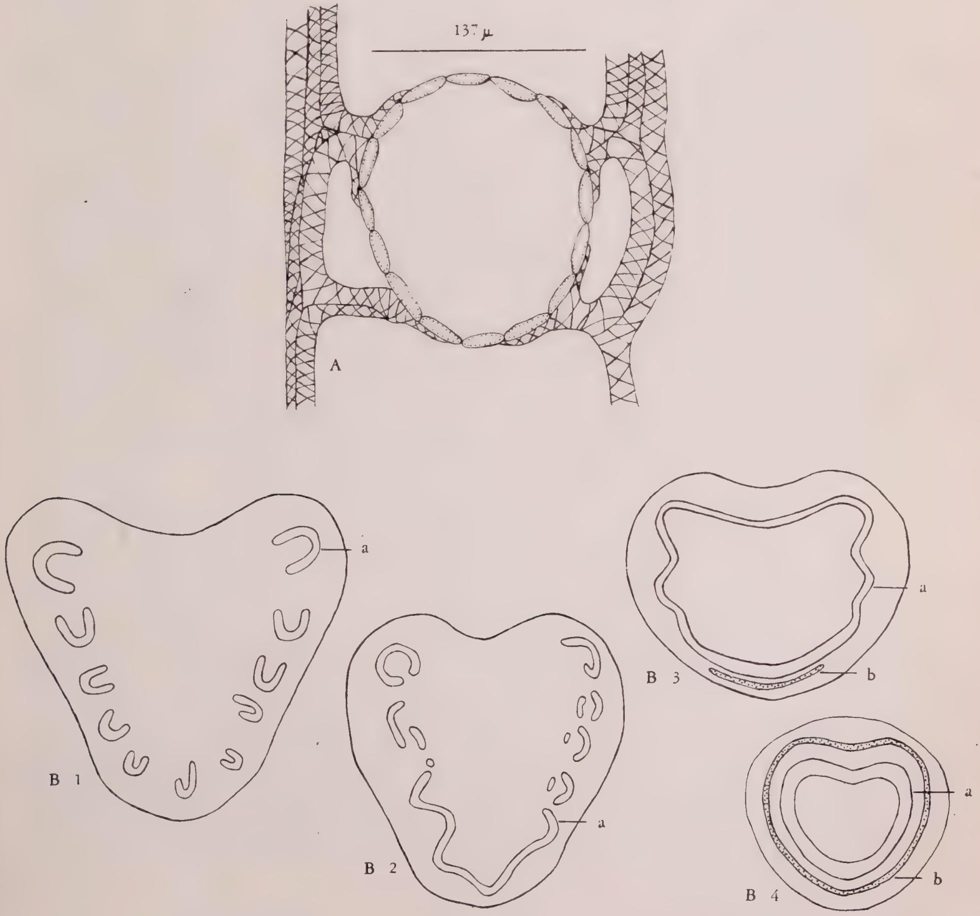


FIG. 3. A, *Sohnreyia excelsa,* diagrammatic representation of secretory cavity from leaf to show association with vascular tissue and illustrate the general nature of these structures in the taxa under consideration. B, 1–4, *Diomma ulei,* serial sections of petiole from lower pulvinus at 1 to upper pulvinus at 4, demonstrating the formation of a vascular cylinder from originally distinct vascular strands at 1 (*a* = vascular tissue, *b* = sclerenchymatous zone).

Secretory cells retain the ergastic substance (e.g. oil, mucilage, resin), whereas cells in a secretory epithelium release ergastic material, by one means or another, into the intercellular space. A secretory intercellular space which is pocket-like and of more or less definite shape and size is termed a secretory cavity (Stern 1954). Secretory cavities occur in the pistils and leaves of *Diomma* and *Sohnreyia.*

Secretory cavities in the pistils of *Diomma* (fig. 1A–C) and *Sohnreyia* are essentially similar in form, number and location. Two cavities are present in each pistil, one in the median dorsum of each carpel, close to the outer wall. The secretory cavities are elongate, tapering gradually from the more or less bulbous base toward the attenuate apex. A yellowish material was observed in these pouches in one specimen.

The leaves of *Sohnreyia* and all species of *Diomma* are characterized by the presence of secretory cavities in the mesophyll. These cavities vary from 72 to 172 μ in diameter and average about 100 μ. The secretory epithelium appears to be 1 or sometimes 2 cell layers thick. Cavities nestle within a basket-like network of vascular bundles (figs. 3A, 4).

In addition to secretory cavities, leaves of all species of *Diomma* possess elongate secretory cells distributed among the chlorenchymatous cells of the palisade mesophyll (fig. 4). These are larger in paradermal section than the palisade cells and average 26 μ in diameter, ranging from 14 to 47 μ. In length they approximate that of the palisade cells.

The distribution of secretory structures in the available specimens of the two genera is summarized in the key below. It should be emphasized that the positions given are apparently not immutable, but may vary to a certain degree. For example, in species described as having secretory cavities located along the margin of the leaflet, an occasional cavity may occur elsewhere in the leaflet.

1. Secretory cells present in leaves and scattered among the chlorenchymatous cells of the palisade layer. *Diomma.*
    2. Secretory cavities confined to the margin of the leaflet. "*Diomma ulei* distribution":
        E. Ule 8646; J. A. Steyermark 75699, 58982, 59798; J. A. Steyermark & J. J. Wurdack 938, 1099; B. Maguire, J. J. Wurdack & C. Maguire 42315, 42329.
    2. Secretory cavities dispersed throughout the mesophyll of the leaflet. "*Diomma fruticosa* distribution":
        J. A. Steyermark 60820; B. Maguire & J. J. Wurdack 33808.
1. Secretory cells absent in leaves. *Sohnreyia.*

XYLEM ANATOMY

Whether the concentric marks that appear on the transverse sections of both *Diomma* and *Sohnreyia* (fig. 5C) are related to seasonal increments in stem diameter is unknown. It is probably best therefore, to refer to these lines in a general way as concentric growth marks (Chowdhury 1939). Concentric growth marks in *Sohnreyia* are regularly spaced and obvious because of a pronounced thickening in the walls of the imperforate tracheary elements and the presence of a band of axial parenchyma associated with these thicker-walled fibers. Growth marks in *Diomma* are irregularly spaced and seem to be erratically produced. Some of these rings are visible because of their delimitation by a narrow band of axial parenchyma (fig. 5A) and/or close tangential aggregations of

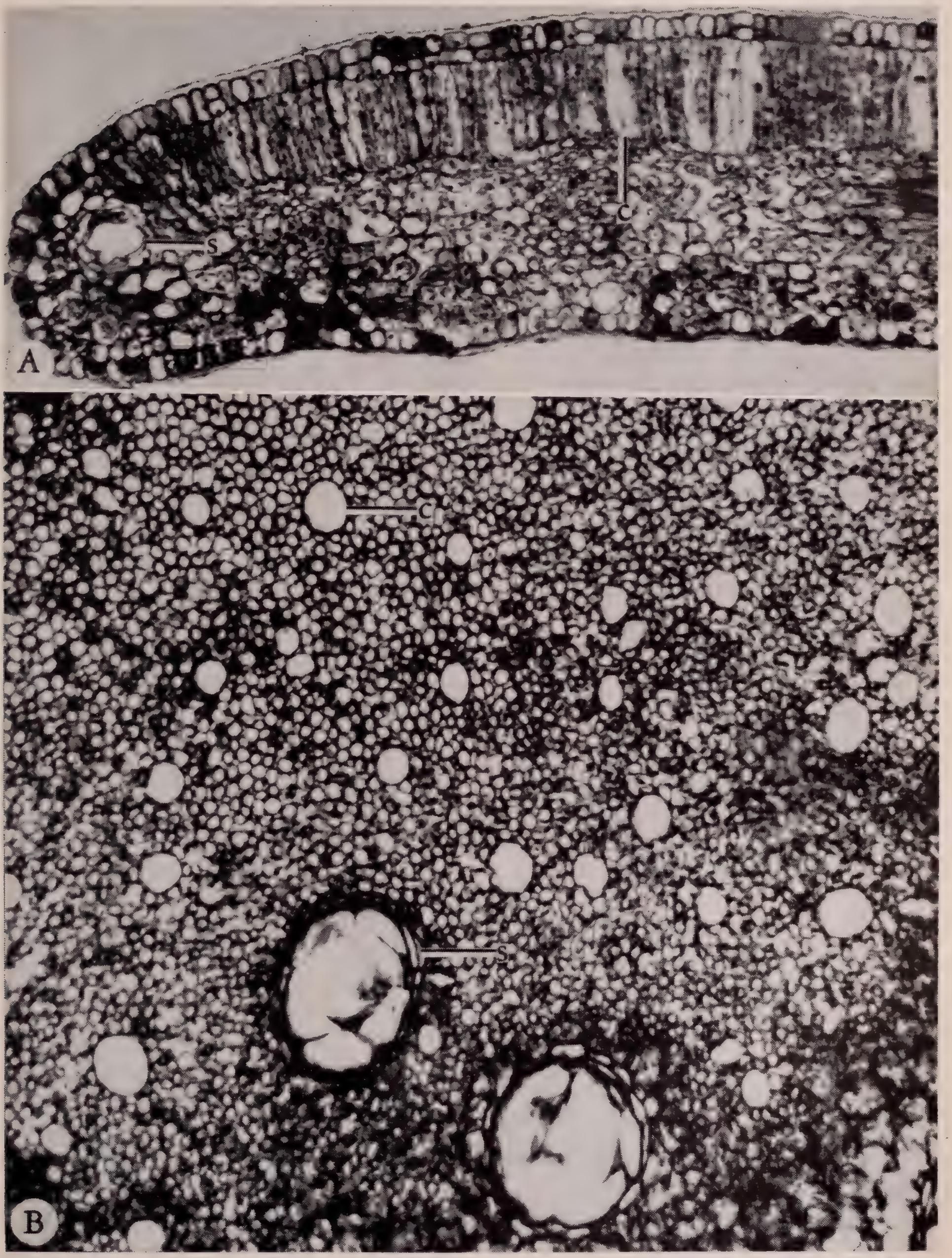


FIG. 4. A, *Diomma* species B, transection through leaf to illustrate marginal secretory cavities *s* and secretory cells *c* in palisade mesophyll, × 140. B, *D. fruticosa,* paradermal section of leaf showing secretory cells *c* among chlorenchymatous cells of the palisade mesophyll and scattered secretory cavities *s,* × 180.

pores. However, it is felt that this particular specimen is abnormal or juvenile as there is a fairly wide conspicuous band, 1–3 mm wide, near the center of the stem which is composed of great numbers of closely placed pores and abundant paratracheal parenchyma. This concentric band resembles the early wood of ring-porous species. It is possible, therefore, that were it not for the effect of this seemingly abnormal or juvenile condition on the remainder of the xylem cylinder, the concentric growth marks elsewhere in the stem of *Diomma* would be of regular occurrence as in *Sohnreyia*. Both genera exhibit diffuse-porous wood.

Imperforate tracheary elements in both genera are fiber-tracheids bearing pits with rounded borders and extended inner apertures. Length varies from very short to short (table 1; Chattaway 1932). In *Diomma* and *Sohnreyia* pores (fig. 5A, C) are mostly distributed as radial multiples (2–10 cells), over half appearing in this form. It is interesting to note the occurrence of occasional chains of pores in each genus (table 2). Pores are circular in outline and extremely small to moderate-sized in diameter (table 1; Chattaway 1932). Vessel elements are short to very long, and end walls are oblique, but generally not less than 45° (table 1; Chattaway 1932). Intervascular pitting is strictly alternate, although in *Diomma* there is a local tendency to opposite pitting. Perforation plates are simple, but in *Diomma* vestigial bars in the form of mucros were occasionally observed projecting from the rim of the plate.

Vascular rays are generally heterocellular in *Sohnreyia* (fig. 5D) the multiseriate rays exhibiting upper and lower uniseriate ''wings'' varying from a single marginal cell to 7 cells high. Vascular rays in *Diomma* (fig. 5B) are essentially homocellular and consist mostly of procumbent cells. The sporadic occurrence of multiseriate rays with terminal uniseriate ''wings'' was noted, but cells in these wings were generally procumbent. Occasionally a small ''square'' cell was observed in the radial view. Uniseriate ''wings'' are mostly less than 6 cells in height.

Vascular rays in *Sohnreyia* are regularly triseriate, with some biseriate rays. The uniseriate and quadriseriate conditions are rare. In *Diomma* the biseriate ray is most abundant with uniseriate rays of fairly common occurrence. Triseriate rays are very scarce.

Axial xylem parenchyma in both genera occurs apo- and paratracheally. In *Sohnreyia* (fig. 5C) concentric bands 2–3 (4) cells wide are of regular occurrence. A few strands of parenchyma were also noted in association with vessels or groups of vessels. Concentric bands of axial parenchyma also appear in *Diomma* (fig. 5A), but these are mostly 1 cell wide and are irregularly distributed on the transverse section. Incomplete sheaths of axial parenchyma, 1–2 cells wide, are associated with the vessels.

It is apparent from the above description that the xylem anatomy of *Sohnreyia* and *Diomma* is very similar. A few points of difference are however noted in the following features: (1) concentric bands of axial parenchyma are 2–3 cells wide in *Sohnreyia* and only 1 cell wide in *Diomma,* (2) vascular rays are usually heterocellular in *Sohnreyia* and essentially homocellular in *Diomma,* and (3) vascular rays are regularly triseriate in *Sohnreyia* and biseriate in *Diomma.* In considering the significance of these differences thought should be given to the fact that only one wood specimen of each genus was available for analysis,

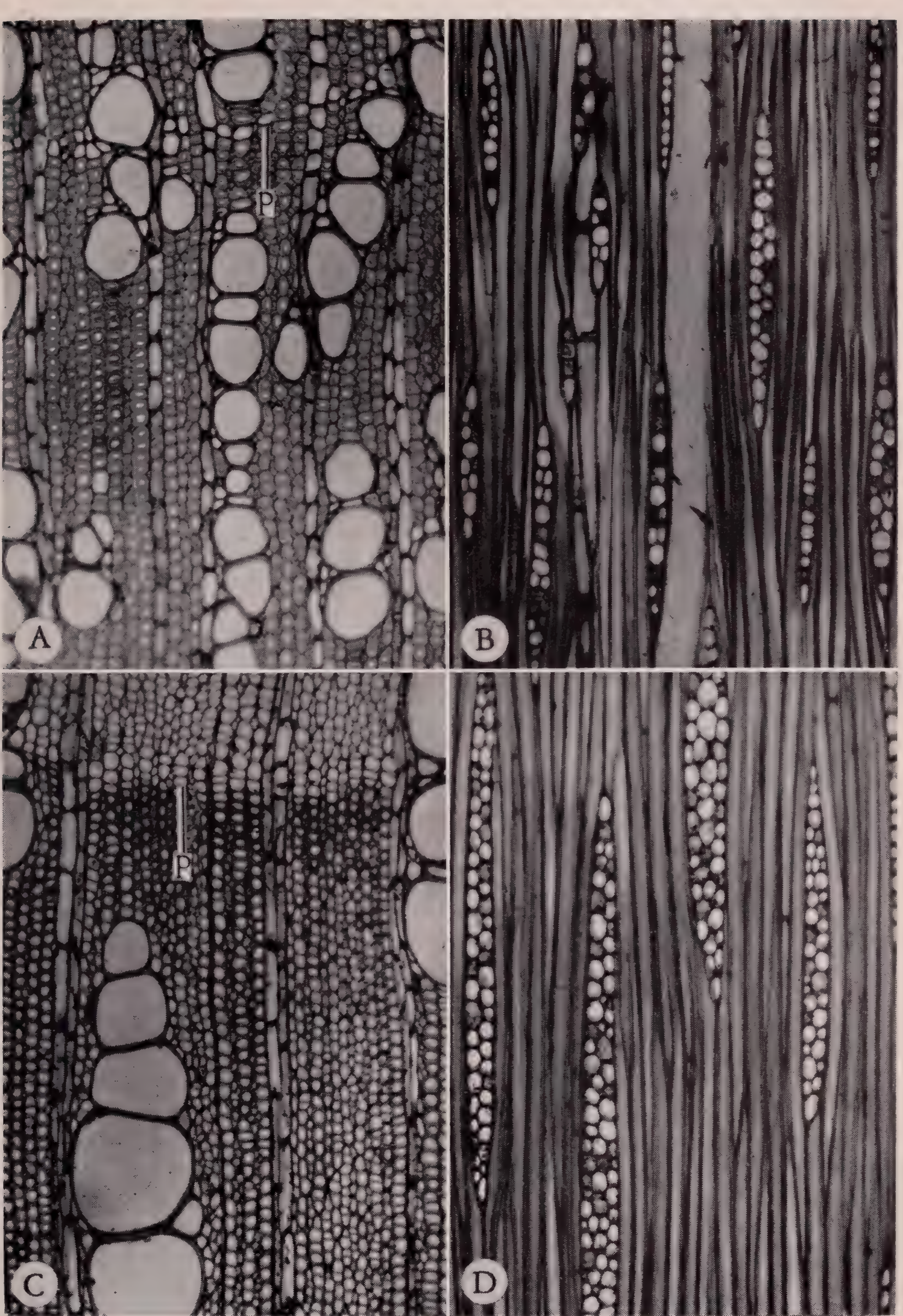


FIG. 5. A, B, *Diomma* species B, wood. A, Transection to show uniseriate banded axial parenchyma *p*, and pores in radial multiples. B, Tangential section illustrating uni- and biseriate condition of vascular rays and oblique end walls of vessel elements, × 98. C, D, *Sohnreyia excelsa*, wood. C, Transection to show 2–4-cell wide condition of the banded axial parenchyma *p*, and pores in radial multiples D, Tangential section illustrating bi- and triseriate vascular rays, × 98.

and it is probable that an abnormality exists in the *Diomma* specimen and/or it does not exhibit mature characteristics.

Table 1. Dimensions of tracheary elements.

	Mean	Range
Diomma		
Fiber-tracheid length	786 μ	405–1200 μ
Pore diameter	63 μ	29–104 μ
Vessel element length	538 μ	300–825 μ
Angle of vessel element end wall	54°	75–30°
Sohnreyia		
Fiber-tracheid length	901 μ	450–1170 μ
Pore diameter	97 μ	40–165 μ
Vessel element length	509 μ	360–780 μ
Angle of vessel element end wall	54°	80–10°

Table 2. Pore distribution in per cent.

	Solitary	Radial multiples	Clusters	Chains
Diomma	36.4	53.0	10.6	few
Sohnreyia	34.3	60.0	5.7	few

DISCUSSION

Two species of *Diomma*, *D. ulei* and *D. fruticosa*, and *Sohnreyia excelsa* have been validly described in the literature and represent distinct biological entities. In the course of our researches, we were able to examine more specimens assigned to each of these genera than were available to previous workers. Examination of these specimens brought to light only the single heretofore described species of *Sohnreyia*. However, besides the two previously described species of *Diomma*, material of at least two further species was present among our specimens. In this work these have been designated for convenience *Diomma* species A and *Diomma species* B. Collections representative of these are listed at the end of the section on methods and materials.

Relationships of Diomma.

It is the contention of the authors that the characteristics of *Diomma* definitely indicate its placement among the *Rutaceae*. The general structure of flowers and fruits is rutaceous in all respects except for the presence of apotropous ovules. This latter feature, however, also occurs in the genera *Spathelia* and *Sohnreyia*, both of which have been included in *Rutaceae* by Engler (1931). However, Harms (1931a) considered the presence of apotropous ovules as a characteristic that argued against joining *Diomma* with any of the families of *Geraniales* (sensu Engler).

If we were to extend Harms' thesis on ovule position in *Diomma* to other groups and exclude certain taxa on the basis of this single characteristic, many unnatural relationships would result. Consider *Rhamnales: Rhamnaceae* possess epitropous ovules, but *Vitaceae* and *Leeaceae* are distinguished by apotropous ovules (Suessenguth 1953). Most *Meliaceae* are epitropous, but *Cedreloideae* are apotropous; most *Simaroubaceae* are epitropous, but *Alvaradoideae* are apotropous. Within other families, ovule position varies among the genera. This is true for example, in *Theaceae* (Melchior 1925) and *Guttiferae* (Engler 1925). Apparently the taxonomic significance of ovule position, as well as of other characteristics, depends upon the taxa in question. In certain groups it may be important only in characterizing subfamilies, in other groups it may be important at the family level, and it is entirely possible that it may have little or no taxonomic importance whatsoever. It seems to the authors, therefore, too restrictive to exclude *Diomma* from *Rutaceae* on the basis of a single characteristic when so many other features of the genus indicate its rutaceous nature.

The occurrence of secretory elements in the leaves of *Diomma* points to a union with *Rutaceae*. Blenk (1884) was among the first to report the occurrence of secretory cells in leaves of *Rutaceae*, namely in *Spathelia simplex* L., considered in *Simaroubaceae* at that time. About 20 years later, Schulze (1902) mentioned secretory cells in leaves of *Zanthoxylum fagara* L. Neither Solereder (1908) nor Metcalfe and Chalk (1950) mention the occurrence of these cells in leaves of *Rutaceae* except for Solereder's citation of Schulze's work.

The secretory structures that are obvious when one examines leaves of *Rutaceae* are secretory cavities; secretory cells are visible only with the aid of the compound microscope. Engler (1931) states that the secretory cavities that occur in *Rutaceae* serve to distinguish this family from the closely related *Simaroubaceae* and *Meliaceae*. The authors would like to suggest that the occurrence and distribution of secretory cells and their relationship to secretory cavities within *Rutaceae* may be of considerable taxonomic importance.

Although in our study we have been able to examine relatively few specimens, statistically speaking, several observations are perhaps worthy of note: (1) The presence of secretory cells in the leaves of *Diomma* serves to distinguish this genus from *Sohnreyia*. In this regard, the occurrence of secretory cells seems to be of generic significance. (2) The distribution of secretory cavities, on the other hand, may be of specific value, at least in *Diomma*. In the "*Diomma ulei* distribution," secretory cavities are confined for the most part to the margins of leaflets; in the "*Diomma fruticosa* distribution," secretory cavities are dispersed throughout the mesophyll of the leaflet.

Xylem anatomy in *Diomma* resembles that of many rutaceous species. The presence of pore chains and abundant radial pore multiples, in particular, is characteristic of a number of Rutaceae. Furthermore, woods of *Rutaceae* as a whole are relatively consistent in their wood structure with respect to the occurrence of diffuse porosity, simple perforation plates in the vessels, alternate intervascular pitting, axial parenchyma which in many cases is scanty paratracheal with or without terminal or non-terminal bands, and non-septate fibers with simple or narrowly bordered pit-pairs (Heimsch 1942)

Pollen morphology of *Diomma* does not contradict its placement in *Rutaceae*. A preliminary report of investigations (G. Erdtman, in correspondence) indicates that "The pollen grains in *Sohnreyia excelsa*, in *Diomma* sp. and *Spathelia subintegra* (as well as in *S. cubensis*) have certain characteristics in common with those of *Dictyoloma* and in *Evodia duiellia* (possibly also with those in *Chloroxylon* and *Chorilaena*)."

The condition of monocarpy, that is, where death of the plant follows flowering and fruiting, has been reported in *Rutaceae*, especially in the genera *Sohnreyia* (Ducke 1930; Krause 1921) and *Spathelia* (Marie-Victorin 1948; Fawcett & Rendle 1920; Wilson 1911). As far as the present authors are aware, this condition does not obtain in *Simaroubaceae*. At this point it might be of importance to note that data on the occurrence of monocarpy among dicotyledons are scarce. The condition is also known in certain aborescent species of *Lobelia* (Krause 1921) and in many shrubby genera of *Strobilanthinae-Acanthaceae* (Bremekamp 1944).

According to the results of an extensive survey of nodal conditions and leaf anatomy currently under way in the laboratory of Dr. Richard A. Howard, petioles of *Rutaceae* are characterized by a ring of vascular tissue without associated medullary bundles. This condition has been reported above for *Diomma*. Petiolar anatomy in *Simaroubaceae* also consists of a ring of vascular tissue, but with or without associated medullary bundles.

Plants with the palm-like appearance attributed to *Diomma* are referred to in German botanical literature as *Schopfbäume* or tufted trees. The occurrence of this manner of growth among dicotyledons appears to have significance only at the species, or at most the genus level, for it is widespread among the species of many families: e.g. *Theophrastaceae* (*Clavija, Theophrasta*), *Compositae* (*Verononia* spp.), *Caricaceae* (*Carica*), *Meliaceae, Simaroubaceae, Sapindaceae,* and *Anacardiaceae* (Harms 1912, 1940; Mildbraed 1922). It should not seem strange, therefore, to place the *schopfbaumartig Diomma* in *Rutaceae,* for we already know that *Sohnreyia* and *Spathelia* are of this form (Krause 1914; Marie-Victorin 1948), as well as the following *Rutaceae: Leptothyrsa* (Engler 1931), certain species of *Cusparia* (Engler 1931), and *Dictyoloma peruvianum* (Macbride 1949).

In order to locate the most natural position for *Diomma* among the infrafamilial taxa of *Rutaceae,* it has been necessary to review more or less closely the characteristics upon which these taxa have been based. Moreover, when the authors reached a tentative hypothesis in this regard, careful examination of the possible near relatives of *Diomma* was indicated. *Sohnreyia;* which will be demonstrated as probably the closest ally, has been analyzed in detail and the results are reported above. *Spathelia,* a somewhat more distant relative, was studied in less detail. The actual results of the observations on *Spathelia* will be incorporated in the following sections.

Comparison of Diomma with Sohnreyia.

Diomma and *Sohnreyia* are similar to each other in the following respects: (1) both exhibit a *schopfbaumartig* appearance, (2) both are presumably monocarpous, (3) secretory cavities are present in leaves of each, (4) the basic structure of the flower and fruit is the same in each genus, (5) both possess apotropous ovules, (6) pistils in each genus contain 2 similarly placed secretory cavities, (7) each genus is polygamous, (8) xylem anatomy is very similar in these genera, (9) pollen grains are apparently alike, and (10) pinnately compound, estipulate leaves occur in each genus. Despite these many resemblances, *Diomma* and *Sohnreyia* are distinct and differ in the following characters: (1) secretory cells are present in leaves of *Diomma* but are lacking in *Sohnreyia,* (2) appendages of staminal filaments in *Diomma* (except *D. ulei*) appear to be lateral wing-like proliferations of the filaments, whereas in *Sohnreyia,* staminal processes are fused with the ventra of the filaments for most of their length, but the ligulate apex is directed ovary-ward, (3) ovaries in female flowers of *Diomma* are almost sessile (gynophore rudimentary) but in *Sohnreyia* ovaries are conspicuously stipitate (fig. 1F), (4) insides of the locules of the ovary and fruit are entirely glabrous in *Diomma* but pubescent in *Sohnreyia,* (5) the stellate hairs characteristic of *Diomma* have not been observed in *Sohnreyia.*

Comparison of Diomma with Spathelia.

The genus *Spathelia* contains 14 species and is apparently restricted to the West Indies (Marie-Victorin 1948). It constitutes a monogeneric subfamily of *Rutaceae,* the *Spathelioideae* (Engler 1931). This genus has a number of characteristics in common with *Diomma.*

Plants of *Spathelia* are characterized, as are those of *Diomma,* by unbranched trunks with leaves crowded at the apex—*Schopfbäume.* Monocarpy is a characteristic of *Spathelia.* Leaves are pinnately compound and the leaflets exhibit marginal secretory cavities and scattered secretory cells. *Diomma* and *Spathelia* are polygamous genera.

Floral parts in *Spathelia* are basically pentamerous as in *Diomma.* Sepals and petals in *Spathelia* both possess an apical glandular cavity. A gynophore is present beneath the ovaries in *Spathelia;* it is always very tiny in female flowers, but may be more or less conspicuous in male flowers. Pollen grains of *Spathelia* resemble those of *Diomma.* Both genera produce winged fruits .

The xylem anatomy of *Spathelia vernicosa* (Yw; *León s.n.*) is essentially the same as that of *Diomma* and indeed of many *Rutaceae* (Heimsch 1942). *S. vernicosa* exhibits diffuse porous wood. The fiber-tracheids are characterized by minute bordered pits and walls that are from thick to very thick. Pores are distributed mainly as radial multiples some of which contain over 12 pores. Solitary pores are of common occurrence and are more aboundant than pore clusters. Some of the latter are fairly extensive, being 20 or more pores in size. Radial pore multiples verge on pore chain configuration in some instances. The perforation plates are exclusively simple, and vessel element end walls are mostly oblique. Intervascular pitting is strictly alternate and the pits are small with round borders. Vascular rays are heterocellular and 1–3 cells wide. Most rays are uniseriate but biseriate rays are common. Triseriate rays are rare. Although a single wide (± 12 cells) band of axial parenchyma occurs in our specimen, it is believed to be of traumatic occurrence, since (1) certain of the cells are irregular and abnormal in appearance, and (2) it is the only band present on the sections. Nevertheless, its presence probably indicates the potential of band formation in the genus. Scanty vasicentric axial parenchyma is regularly present. Only a few strands, or none at all, are in contact with vessels on a given transverse section.

Many species of *Spathelia* are characterized by alate staminal appendages more or less similar to those of *Diomma* (fig. 2F–I). Other species are devoid of these appendages, much as in *Diomma ulei.* The shape and means of attachment to the filament of these appendages differ with the species of *Spathelia,* the genus being inconstant in this respect. It might be well to recall at this juncture that in species of *Diomma* exhibiting filament processes, the latter appear as lateral expansions of the filament, and in this *Diomma* seems to differ from *Sohnreyia* whose staminal appendages are probably fused with the ventra of the filaments. We note that within *Spathelia* both the *Diomma* and the *Sohnreyia* types of staminal process are present, as well as other types, and even unappendaged filaments. For example, lateral appendages like those in *Diomma* occur in *Spathelia simplex* L. (*Stearn 162* as *S. sorbifolia* L.) ; scale-like, bilobed appendages occur in *S. cubensis* P. Wils. (*Wright 2192*) ; fairly large, almost truncate appendages are found in *S. subintegra* Marie-Vict. (*Wright 2191*) ; and unappendaged filaments as in *Diomma ulei* are found in *S. glabrescens* Planch. (*Stearn 1003*). Illustrations of these examples occur in figure 2.

Locules in *Spathelia* as in *Diomma* are uniovulate. Although Bentham and Hooker (1862) and Engler (1931) mention geminate ovules in the locules of *Spathelia*, Fawcett and Rendle (1920) state: ". . . ovules one in each cell . . . pendulous from the inner angle at the apex of each ovary-cell." The authors have also observed only uniovulate locules in ovaries of female flowers of *S. simplex* and *S. subintegra*. Furthermore, it can be demonstrated that the ovules in *Spathelia* are apotropous as in *Diomma*. It is worthy of note in this regard, that even in 1858, Agardh presumed that ovules of *Spathelia* were apotropous from Gaertner's description of the seeds of *S. simplex* (1788). Dorsal, elongate secretory cavities occur in the carpels of *Spathelia* (fig. 1D) as in those of *Diomma*. However, they are more conspicuous in *Spathelia*, especially in the fruiting condition.

Differences, of course, do occur between *Spathelia* and *Diomma*. The leaves in *Spathelia* may be many-foliolate—up to 100-jugate; whereas in *Diomma*, 22 pairs of leaflets appear at present to be maximal. Leaflets in *Spathelia* are generally small to medium-sized (up to 15 cm long in *S. glabrescens* and to 20 cm long in *S. simplex*), and only rarely entire. In *Diomma*, on the other hand, leaflets are generally large and entire.

Aestivation of sepals in *Spathelia* follows two patterns: valvate (e.g. *S. glabrescens* and *S. subintegra*) and imbricate (*S. cubensis* and *S. simplex*). In *Diomma* sepalar aestivation is imbricate. Although glandular cavities occur at the tips of perianth parts in *Diomma*, they are tiny and inconspicuous compared with those of *Spathelia*.

The ovary in *Spathelia* is regularly 3-carpellate and 3-locular and only rarely 2-carpellate and 2-locular (Fawcett & Rendle 1920). On the other hand, the ovary in *Diomma* is generally 2-carpellate and 2-locular, 3-carpellate and 3-locular ovaries being of exceptional occurrence (fig. 1). The fruits of *Spathelia* are narrowly winged; those of *Diomma* possess broad wings. Seeds of *Spathelia* contain a fleshy endosperm, whereas *Diomma* seeds are lacking in endosperm. The embryo in *Spathelia* has linear-oblong cotyledons, but these are suborbicular to ovate in *Diomma*.

The Position of Diomma in Rutaceae

From the foregoing discussion it is not too presumptuous to state that *Diomma* has a definite and more or less close relationship to *Sohnreyia* and *Spathelia*. *Sohnreyia excelsa* is the only member of the subtribe *Sohnreyiinae* of the tribe *Toddalieae*, subfamily *Toddalioideae*. It might seem reasonable to place *Diomma* in this subtribe with *Sohnreyia*, and to raise *Sohnreyiinae* to the rank of subfamily, because of the presence of apotropous ovules in both genera. However, the subfamily *Spathelioideae*, of which *Spathelia* is the sole member, already exists in *Rutaceae*, and it is characterized and distinguished from all other *Rutaceae* by the presence of apotropous ovules. Therefore, aside from two differences among *Diomma*, *Sohnreyia*, and *Spathelia* to be discussed below, the authors can see no reason for not including these three genera in *Spathelioideae* sensu novo. The only objections which might be raised to the above proposal involve the valvate or "subvalvate" aestivation of sepals, and the endospermous seeds of *Spathelia*. Sepalar aestivation is imbricate in *Diomma* and *Sohnreyia*, and the seeds of these genera lack endosperm.

Regarding aestivation of sepals, we can see no insurmountable obstacle to our scheme, for both types have been recorded in *Rutaceae*. Engler (1931) mentions aestivation of sepals in *Rutaceae* as mostly imbricate. Eichler (1878), in his analysis of rutaceous flowers, mentions that open, valvate, and imbricate aestivation occur in almost all subfamilies of *Rutaceae*. For example, sepals are valvate in *Calodendron* and *Melanococca* according to Bentham and Hooker (1862); valvate in *Bauerella* and mostly valvate in *Boronia* sect. *Valvatae* Benth. (Engler 1931). It appears then that in *Rutaceae*, aestivation of sepals is at most a characteristic of generic significance and that related genera may differ in this regard.

A few original observations on aestivation in sepals of *Spathelia* indicate that, contrary to reports in the literature, aestivation in this genus may be valvate (e.g. *S. glabrescens* Planch. and *S. subintegra* Marie-Vict.) or imbricate (e.g. *S. cubensis* P. Wils. and *S. simplex* L.). Other authors have used the term "subvalvate" in referring to aestivation of sepals in *Spathelia*. Such a term is likely to be confusing and certain to be subjective.

In Engler's general statement of the characteristics of *Rutaceae* (1931), he notes: "*Samen . . . mit oder ohne Nährgewebe.*" A survey of Engler's data indicates that within subfamilies of *Rutaceae* differences in presence or absence of endosperm are found. A few examples may be pertinent: (1) In the subfamily *Rutoideae*, most members of the tribe *Xanthoxyleae* possess exendospermous seeds, whereas in the tribes *Ruteae* and *Boronieae* members possess endospermous seeds; (2) in the subfamily *Toddalioideae*, members of the tribe *Toddalieae* may or may not have endosperm. Thus, the presence or absence of endosperm in the seeds of *Rutaceae* does not seem to be a constant characteristic of a subfamily and is probably merely of generic importance.

From the above, the authors conclude that neither the differences in sepalar aestivation nor the presence or absence of endosperm in the three genera under consideration represents a valid criterion against the erection of the subfamily *Spathelioideae* to contain *Diomma*, *Sohnreyia*, and *Spathelia*. In regard to our proposal of *Spathelioideae* sensu novo, Erdtman (in correspondence) states, ". . . pollen morphology does not speak against your view of referring *Sohnreyia*, *Diomma*, and *Spathelia* to the *Rutaceae*, as a special subfamily." *Spathelioideae*, as constituted herein, differs from all other subfamilies of *Rutaceae* in the presence of apotropous ovules, much as the *Cedreloideae* differ from other subfamilies of *Meliaceae*.

It appears that within this subfamily, *Spathelia* is more primitive than either *Diomma* or *Sohnreyia*. Several conditions in *Diomma* and *Sohnreyia* seem to represent reductions or specializations from that which obtains in *Spathelia*. For example, although *Spathelia* regularly has tricarpellate ovaries, both *Diomma* and *Sohnreyia* regularly have bicarpellate ovaries. Tricarpellate ovaries do appear sporadically in the latter genera, which may indicate a reduction from that state. Seeds in *Spathelia* are endospermous, whereas endosperm is absent in the seeds of *Diomma* and *Sohnreyia*. Wings on the fruits of *Spathelia* are relatively undeveloped, which may indicate a primitive condition. Fruit wings are broad in *Diomma* and *Sohnreyia*. There also seems to be a lack of stability in certain features of *Spathelia*, which again may be interpreted as a state of primitiveness. This is found in the inconstant type of sepalar aestivation, and in the wide variety of form in staminal processes. It may also be true that the well-developed secretory glands, such as are found in carpels of *Spathelia*, are less advanced than the smaller, reduced glands in the carpels of *Diomma* and *Sohnreyia*. Arguments for and against the primitiveness or advancedness of certain characteristics in plants can sometimes be interpreted in two ways. The above, therefore, is only meant to state the authors' opinions.

Actually the occurrence of the *schopfbaumartig* habit and monocarpy in the three genera under discussion is based on a relatively small body of information. If it is subsequently shown that these two features are in truth constant characters of all species of *Spathelia*, *Diomma*, and *Sohnreyia*, it will strengthen the structure of *Spathelioideae* sensu novo. Further, more detailed studies, on a wide variety of material, are desirable to determine the exact nature of the staminal filament proliferations described for these genera.

CONCLUSIONS

1. The genera *Diomma*, incertae sedis, and *Sohnreyia*, *Rutaceae*, are closely related.

2. *Diomma* is definitely a member of *Rutaceae* (sensu Engler 1931) as is shown by investigations of floral morphology, pollen structure, secretory elements, nodal anatomy, petiole vascular structure, and wood anatomy.

3. *Diomma* and *Sohnreyia* should be included in the subfamily *Spathelioideae*, sensu novo, as they are both closely related to *Spathelia*.

ACKNOWLEDGMENTS

For their interest in suggesting the problem and their help throughout the progress of the study, the authors express their gratitude to Dr. Bassett Maguire and Dr. John J. Wurdack of the New York Botanical Garden and Dr. Richard S. Cowan of the U. S. National Herbarium. The following botanists were very kind in arranging for loans of study specimens from their respective institutions and the authors appreciate their efforts: Dr. Theodor Just of the Chicago Natural History Museum, Mr. William T. Stearn of the British Museum, Dr. G. Taylor of the Royal Botanic Gardens, Kew, Dr. H. J. Lam of the Rijksherbarium, Leiden, Dr. Charles Baehni of the Conservatoire et Jardin Botaniques, Geneva, and Dr. John R. Reeder of Yale University. For his kindness in examining pollen specimens the authors are much indebted to Dr. G. Erdtman of the Palynological Laboratory in Stockholm. Dr. Richard A. Howard of the Arnold Arboretum gave of his time to explain methods for studying petiole sections. Professor I. W. Bailey of Harvard University deserves especial thanks for his critical reading of the manuscript and his suggestions for improvement.

Literature Cited

Agardh, J. G. 1858. Theoria systematis plantarum. 1–404.

Bentham, G. & Hooker, J. D. 1862. Genera plantarum. **1**(1): 1–434.

Blenk, P. 1884. Ueber die durchsichtigen Punkte in den Blättern. Flora **67**: 49–57, 97–112, 136–144, 204–210, 223–225, 275–283, 291–299, 339–349, 355–370, 371–386.

Bremekamp, C. E. B. 1944. Materials for a monograph of the *Strobilanthinae* (*Acanthaceae*). Verh. Nederl. Akad. Wet. Sect. 2. **41**(1): 1–306.

Chattaway, M. Margaret. 1932. Proposed standards for numerical values used in describing woods. Trop. Woods **29**: 20–28.

Chowdhury, K. A. 1939. The formation of growth rings in Indian trees. Indian For. Rec. II. Utilization 2(1): 1–39.

Committee on Nomenclature, International Association of Wood Anatomists. 1957. International glossary of terms used in wood anatomy. Trop. Woods **107**: 1–36.

Cronquist, A. 1945. Additional notes on the *Simaroubaceae*. Brittonia **5**: 469–470.

Ducke, A. 1922. Plantes nouvelles ou peu connues de la région amazonienne. II^e Partie. Arch. Jard. Bot. Rio de Janeiro **3**: 3–281.

————. 1930. Enumeração das plantas amazonicas cultivadas no Jardim Botanico e introduzidas pelo chefe de secção Adolpho Ducke, de 1920 a 1928. Arch. Jard. Bot. Rio de Janeiro **5**: 77–98.

Ducke, A. & Black, G. A. 1953. Phytogeographical notes on the Brazilian Amazon. Anais Acad. Brasil. Ci. **25**: 1–46.

Eichler, A. W. 1878. Blüthendiagramme **2**: 1–575.

Engler, A. 1925. Guttiferae. *In:* A. Engler & K. Prantl, Die Natürlichen Pflanzenfamilien. ed. 2. **21**: 154–237.

————. 1931. Rutaceae. *In:* A. Engler & K. Prantl, Die natürlichen Pflanzenfamilien. ed. 2. **19a**: 187–359.

Fawcett, W. & Rendle, A. B. 1920. Flora of Jamaica. **4**: 1–369.

Gaertner, J. 1788. De fructibus et seminibus plantarum **1**: 1–284.

Harms, H. 1912. Über die Sapindacee *Talisia princeps* Oliv. Verh. Bot. Ver. Brandenburg. **53**: (36)–(40).

————. 1931a. Gattung zweifelhafter Stellung, vielleicht den Simarubaceen anzuschliessen. *Diomma* Engler nach Ule. *In:* A. Engler & K. Prantl, Die natürlichen Pflanzenfamilien. ed. 2. **19a**: 460.

————. 1931b. Über die Gattung *Diomma* Engler. Notizbl. Bot. Gart. Mus. Berlin **11**: 282–284.

————. 1940. Meliaceae. *In:* A. Engler & K. Prantl, Die natürlichen Pflanzenfamilien. ed. 2. **19b1**: 1–172.

Heimsch, C. 1942. Comparative anatomy of the secondary xylem in the "Gruinales" and "Terebinthales" of Wettstein with reference to taxonomic grouping. Lilloa **8**: 83–198.

Johansen, D. A. 1940. Plant microtechnique. 1–523.

Krause, K. 1914. Rutaceae: *In:* Pilger, Plantae Uleanae novae vel minus cognitae. Notizbl. Bot. Gart. Mus. Berlin **6**: 143–149.

————. 1921. Über einen hapaxanthen Baum. Mitt. Deutsch. Dendr. Ges. **31**: 204–206.

Macbride, J. F. 1949. Flora of Peru. Publ. Field Mus. Bot. **13**: (3^2): 511–777.

Marie-Victorin, *Frère*. 1948. Nouvelles études taxonomique sur la flore de Cuba. III. Le genre *Spathelia* (rutacées), avec description de cinq espèces et d'une variété nouvelles. Contr. Inst. Bot. Univ. Montréal **63**: 14–48, 76.

Melchior, H. 1925. Theaceae. *In:* A. Engler & K. Prantl, Die natürlichen Pflanzenfamilien. ed. 2. **21**: 109–154.

Metcalfe, C. R. & Chalk, L. 1950. Anatomy of the dicotyledons. 1–1500.

Mildbraed, J. 1922. Botanik. Wiss. Ergebn. 2ten Deutsch. Zentral-Afrika-Exped. 1910-1911. **2**: 1–718.

Schulze, H. 1902. Beiträge zur Blattanatomie der Rutaceen. Beih. Bot. Centr. **12**: 55–98.

Solereder, H. 1908. Systematic anatomy of the dicotyledons. 1–1182. (transl. L. A. Boodle & F. E. Fritsch).

Stern, W. L. 1954. A suggested classification for intercellular spaces. Bull. Torrey Club **81**: 234–235.

Stern, W. L. & Greene, S. 1958. Some aspects of variation in wood. Trop. Woods **108**: 65–71.

Steyermark, J. A. 1952. Contributions to the flora of Venezuela. Botanical exploration in Venezuela—II. Fieldiana Bot. **28**: 243-447.

Suessenguth, K. 1953. *Rhamnaceae, Vitaceae, Leeaceae. In:* A. Engler & K. Prantl, Die natürlichen Pflanzenfamilien. ed. 2. **20d**: 7–333, 372–398.

Ule, E. 1914. Die Vegetation des Roraima. Bot. Jahrb. **52**(Beibl. 115):42–53.

Wilson, P. 1911. Notes on Rutaceae—VI. Species of *Spathelia*. Torreya **11**: 262–264.

APR. 1960 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN 10(2):58–64

TAXONOMIC RELATIONSHIPS OF DIOMMA ENGLER EX HARMS

Richard S. Cowan and George K. Brizicky
Department of Botany, U. S. National Museum,
Smithsonian Institution, Washington, D. C.
and
Yale University School of Forestry, New Haven, Connecticut

INTRODUCTION

The formal taxonomic conclusions reached in this study can hardly be presented without acknowledging the great debt owed Stern and Brizicky for the very lucid treatment of the anatomy and morphology of this group and its relatives reported in a preceding paper of this serial.* Much of the history as well as the morphology and anatomy of the groups involved is quite adequately set forth in their contribution and will not be repeated here. However, since three former genera are herein reduced to subgenera of a single genus, the reasons for such a modification should be summarized.

The key to the subgenera contrasts the only known differences of any magnitude; it is at once apparent that these are few and in most instances more or less continuous, rather than discontinuous as one may justifiably expect differences of generic stature to be. The many similarities among the three taxa are amply summarized by Stern and Brizicky and it appears obvious that the similarities far outweigh the dissimilarities. The decision that incipient rather than completely former genera are herein reduced to subgenera of a single genus, the reasons for such a modification should be summarized.

The question may be raised that, since this is obviously a monophyletic group, we must account for the present geographic distribution of its parts. If we may place some reliance on the maps presented by Schuchert (1935) showing the configurations of the land masses in and adjoining the Antillean—Carribean region, more or less continuous land masses have been available for migration (via Central America) between Cuba and the Bahamas at one extreme and northern South America on the other for long periods, beginning in the Late Upper Cretaceous and extending well up into the Eocene. Simpson (1940) considers the land connection between North and South America to be a much more recent event—perhaps as late as the Pliocene—but this conclusion does not invalidate the supposition that migration was by a land route between Cuba and northern South America, at least in part. Indeed, the fact that the majority of Cuban species have their closest affinities in South America (Alain 1958) clearly indicates rather efficient intercommunication between the two extremes. In addition to migration over land routes, the powerful winds of Caribbean hurricanes must have played an important role in the dispersal of plants in the West Indian—northern South American region. The winged fruits of all species of *Spathelia,* for example, are susceptible to wind-dispersal, and the present distribution of the genus may be the result of the operation of this agent alone. Whatever mechanism was responsible, it is certainly less novel than the direction of the migration, which is unusual but characteristic of Simpson's "filter land-bridges" (1940), through which migration always occurs in both directions.

---

* **10**: 38–57.

Morphologically, there is good reason to consider subgenus *Spathelia* the least advanced of the three subgenera (see Stern and Brizicky), and since it is presently restricted to the Bahamas, Cuba, and Jamaica, we may consider this area as the original point from which the genus evolved and migrated southwardly, perhaps by a land-route. Such a view would be strengthened by the presence of some representative of the group in the intervening region (but interconnecting taxa are unnecessary if the dispersal is assumed to be via hurricane winds). A single species from Mexico was referred to the genus by Sessé and Mociño, but Wilson (1911) considers it "a very doubtful species." Unfortunately, the original publication by these authors is so poor that it is difficult to determine the exact affinities of the plant depicted.

TAXONOMY

Spathelia Linnaeus, Sp. Pl. ed. 2. 386. 1763. (nom. cons.) (emend. et ampl.)
Spathe P. Browne, Hist. Jam. 187. 1756. (nom. rej.)
Sohnreyia Krause, Notizbl. Bot. Gart. Mus. Berlin **6**: 147–149. 1914.
Diomma Engler ex Harms, Nat. Pflanzenfam. ed. 2. **19a**: 460. 1931.

Monocarpic trees with palm-like habit, the alternate, pinnate leaves congested at the apex of the unbranched trunk. Leaflets opposite to alternate, 10–100-jugate, the margins crenate to entire, glandular punctae restricted to the margins or generally distributed through the blade. Inflorescences terminal, paniculate, to 3 m long, the flowers polygamous. Sepals 5, free to slightly united basally, valvate to imbricate, the apex with a small to large glandular cavity; petals 5, free, imbricate, the apex with a small to large glandular cavity, rarely the latter not obvious. Stamens 5, the filaments exalate to conspicuously alate, the wing shortly free at the apex or completely adnate with the filament, bidentate apically or entire. Gynoecium subsessile to stipitate; stigma 2–3-lobed, sessile or subsessile; ovary 2–3-celled, laterally compressed, the carpels uniovulate, the ovule pendulous, apotropous. Fruit 2–3-winged, indehiscent, the wings narrower to broader than the seed-bearing portion; seed endospermous or not.

Type species: *S. simplex* Linnaeus, loc. cit.

Key to the Subgenera

1. Ovary typically 3-locular, infrequently 2-locular; fruit elliptic to oval, 3 (–2)-winged, each of the wings usually narrower than the seed-bearing portion; each locule with a large, dorsal secretory cavity; seeds with a fleshy endosperm. Leaflets rarely entire, up to 100-jugate. Plants of the West Indies. Subg. 1. *Spathelia.*

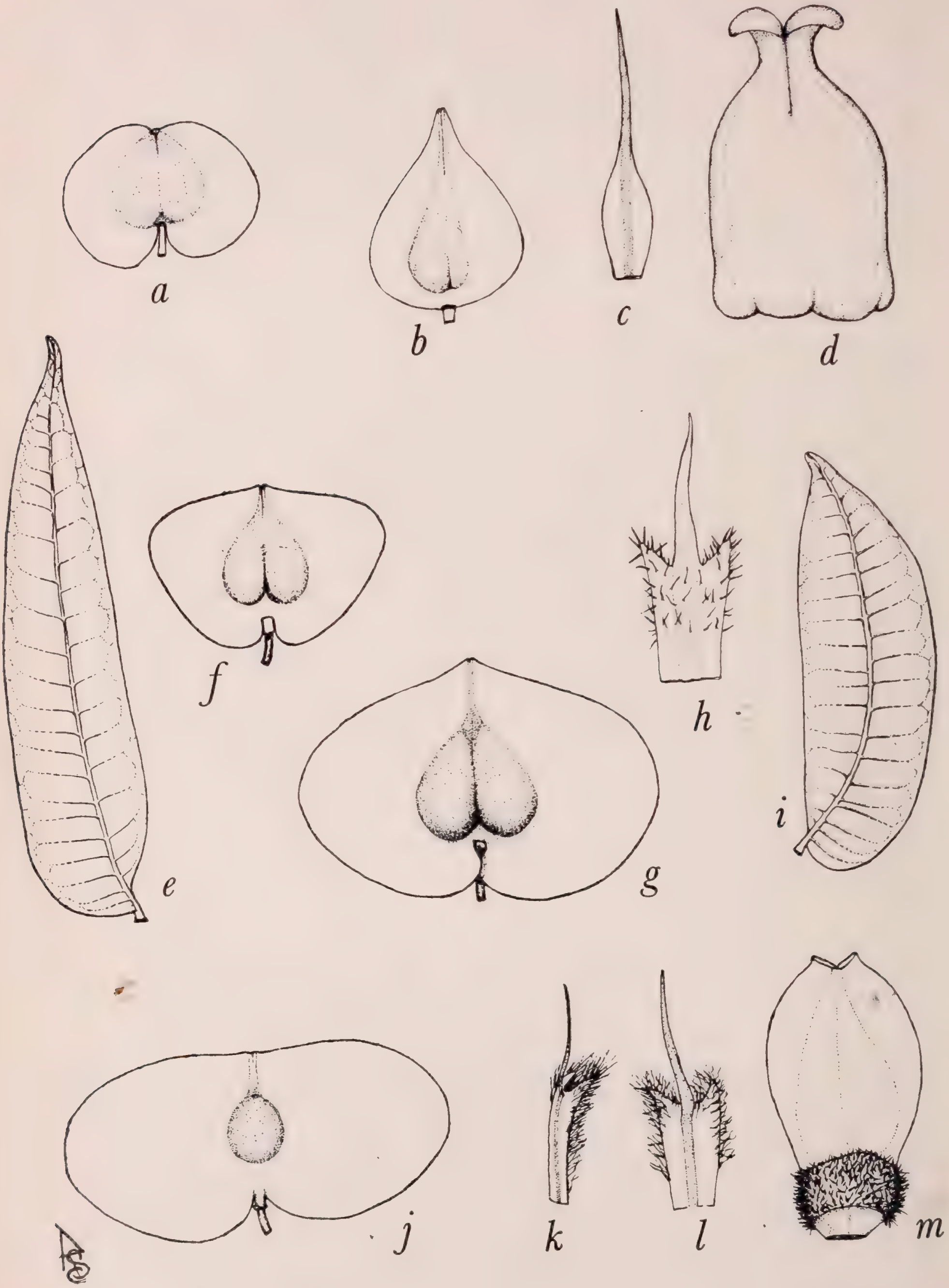
1. Ovary typically 2-locular, rarely 3-locular; fruit ovate to oblate, 2 (–3)-winged, each of the wings usually much broader than the seedbearing portion; locules without a large, dorsal secretory cavity; seeds without endosperm. Leaflets entire, to 27-jugate. Plants of northern South America. 2.

2. Stigma separated from the ovary by a short style, the lobes capitate or subcapitate; gynophore absent or rudimentary; ovary and fruit glabrous within. Secretary cells (microscopic) present in the leaflet tissue. Known only from Guayana. Subg. 2. *Diomma.*

2. Stigma sessile, the lobes plane; gynophore conspicuous; ovary and fruit densely pubescent on the inner surfaces of the locules. Secretory cells absent in the leaflet mesophyll. Known only from northern Amazonia. Subg. 3. *Sohnreyia.*

Spathelia Subg. 1. **Spathelia.**

The fourteen species included in this subgenus are restricted to the Bahamas, Cuba, and Jamaica; the eleven that are endemic to Cuba are distinguished in a


a
b
c
d
e
f
g
h
i
j
k
l
m

partial key and by descriptions presented by León & Alaín (1951). One further, but doubtful, species from Mexico has been proposed by Sessé and Mociño.

Spathelia Subg. 2. **Diomma** (Engler ex Harms) Cowan & Brizicky, stat. nov.

Diomma Engler ex Harms, Nat. Pflanzenfam. ed. 2. **19a**: 460. 1931.

Type Species: *Spathelia* (subg. *Diomma*) *ulei* (Engler ex Harms) Cowan & Brizicky, comb. nov. (based on *Diomma ulei* Engler ex Harms, l.c.)

Key to the Species of Subg. *Diomma*

1. Leaflets with glandular punctae scattered, not limited to the margins. Fruits not over 2.5 cm wide, deeply cordate basally, retuse apically, each half about semicircular. 1. *S. fruticosa.*

1. Leaflets with glandular punctae restricted to the margins. Fruits larger, differently shaped. 2.

2. Filaments not aliform basally or if slightly expanded, not aliform and not bidentate at the apex. Pedicels 4–5.5 mm long. Ovary broadest basally; fruits broadly ovate, attenuate apically, the seed-bearing portion narrowly lanceolate. 2. *S. ulei.*

2. Filaments winged basally. Pedicels 1.5–2.5 mm long. Ovary broadest at about the middle; fruits oblate or obovate-oblate, not attenuate apically, the seed-bearing portion broadly ovate. 3.

3. Median leaflets about 10–12 cm long, oblong, acute, the rachis ca. 30–45 cm long. Fruits glabrous, oblate, slightly apiculate apically, 4 cm broad. 3. *S. chimantaensis.*

3. Median leaflets about 14 cm long, oblong-lanceolate, acuminate, the rachis 47–57 cm long. Fruits puberulous, obovate-oblate, truncate apically, 3 cm broad. 4. *S. neblinaensis.*

1. **Spathelia fruticosa** (Steyermark) Cowan & Brizicky, comb. nov. Fig. 1, a.

Diomma fruticosa Steyermark, Fieldiana Bot. **28**: 272. 1952.

Tree 1–5 m tall, the tip of the stem densely puberulous minutely. Leaves 25–30-foliolate, the leaflets with scattered glandular punctae, the petioles terete except at the canaliculate base, 10–18.5 cm long, densely puberulous but glabrescent, the rachis 42–54 cm long, densely puberulous, glabrescent, the leaflets opposite to alternate, the petiolules 1–2.5 mm long, puberulous but glabrescent, the blades glabrous at maturity, those nearest the leaf base smaller, ca. 9–10 cm long, 3.5–4 cm wide, oblong-ovate, the blades of the upper leaflets larger, slightly to strongly arcuate, oblong-lanceolate or oblong, 9–15 cm long, 3–5 cm wide, the base of all the leaflets inequilateral, the upper side rounded-obtuse, the lower side subobtuse (or rarely acute) to rounded-obtuse, the apex abruptly acute to acuminate with the tip blunt, the venation plane on the upper leaflet surface or the costa slightly salient, the costa and the primary vein-branches salient beneath. Inflorescences 35–63 cm long, the axis densely puberulous, the bracts about 1 mm long, puberulous, the pedicels 1–2 mm long, puberulous. Sepals 1.5–2 mm long, 0.8–1.2 mm wide, oval to narrowly elliptic, emarginate apically, glabrous excepting the ciliolate margin; petals 3.5–4 mm long, 2 mm wide, oval, glabrous.

FIG. 1. *a, Spathelia fruticosa,* fruit, × 1 (drawn from *Steyermark 60327*). *b–d, S. ulei. b,* fruit, × 1; *c,* filament, × 7.5; *d,* ovary, × 10 (drawn from *Ule 8646*). *e–f, S. neblinaensis. e,* leaflet, × 0.5; *f,* immature (?) fruit, × 1 (drawn from *Maguire, Wurdack & Maguire 42329*). *g–i, S. chimantaensis. g,* fruit, × 1; *h,* filament, × 7.5; *i,* leaflet, × 0.5 (drawn from *Steyermark 75699*). *j–m, S. excelsa. j,* fruit, × 1; *k,* lateral view of filament, × 7.5; *l,* view of outer face of filament, × 7.5; *m,* gynoecium, × 7.5 (*j* drawn from *Ducke 20472*, *k–m* drawn from *Ducke 15702*).

Filaments (in staminate flowers) 25 mm long, ligulate with a bidentate, alate basal half, the wing 1 mm wide, villosulose on its inner surface. Gynoecium (in staminate flowers) small, rudimentary, resting on and partly immersed in a short, subglobose to broadly cylindric, puberulous gynophore; pistillate flowers not seen. Fruits glabrous, oblate, retuse and minutely apiculate at the apex and deeply cordate basally, 13–17 mm long, 15–25 mm wide.

VENEZUELA: Bolívar: Kavanayén, alt. 1200 m, 28 Mar 1946, *Lasser 1786* (US); savanna between Kavanayén and base of Ptarí-tepuí, alt. 1200–1300 m, *Maguire and Wurdack 33808* (NY) and 18 Nov 1944, *Steyermark 60327* (F); between La Laja and Santa Teresita de Kavanayén, alt. 1220 m, 30 Nov 1944, *Steyermark 60820* (F, holotype of *Diomma fruticosa* Steyermark).

Although *S. fruticosa* was described from fruiting material only, it stands apart quite distinctly from the remaining species on floral characteristics as well. It differs in the distribution of the glandular punctae in the leaflets, in its shorter pedicels, and in the form of the fruit. It is surely most nearly related to *S. ulei*.

2. **Spathelia ulei** (Engler ex Harms) Cowan & Brizicky, comb. nov. Fig. 1, b–d.

Diomma ulei Engler ex Harms, Nat. Pflanzenfam. ed. 2. **19a**: 460. 1931.

Tree 6–10 m tall, the tip of the stem puberulous and minutely stellate-pubescent but glabrescent. Leaves 20–28-foliolate, the leaflets with glandular punctae restricted to the margins, the petioles somewhat canaliculate basally but otherwise terete, 17 cm long, puberulous, the rachis 45–60 cm long, terete, puberulous, the leaflets subopposite to alternate, glabrous, or puberulous on the upper surface of the costa, the petiolules 4–6 mm long, puberulous, the blades of the lower leaflets smaller, ca. 5–6.5 mm long, 2.5–3 cm wide, oval to oval-oblong, the blades of the upper leaflets larger and oblong or lanceolate-oblong, 14–17 cm long, 3.5–4 cm wide, the base of all the leaflets slightly to very markedly inequilateral, the lower side acute and the upper rounded-obtuse, the apex abruptly acute to acuminate with the tip blunt, the venation plane to impressed on the upper leaflet surfaces, plane to salient beneath. Inflorescence 10–15 cm long, the axis puberulous, the bracts minute, the pedicels 4–5.5 mm long (10–12 mm in the original description), puberulous. Sepals oval, obtuse, entire to emarginate, 3 mm long, 2 mm wide, glabrous except ciliolate; petals elliptic, 5–6 mm long, 4 mm wide, glabrous to sparingly ciliolate. Filaments (in pistillate flowers) 3.5–4 mm long, ligulate, linear or subulate or with the basal half somewhat expanded laterally, sparingly villose basally on the inner surface. Gynoecium glabrous, the stigma bifid, each half capitate, the style about 0.3–0.5 mm long, columnar, the ovary oblong-ovate to broadly ovate, ca. 2.5–4 mm long, 2–3 mm wide, the base broad and with 4 (5?) bulbous sparsely pubescent nectaries. Fruit broadly ovate, acuminate, 2.5–3 cm long, 2–3 cm broad.

VENEZUELA: Bolívar: Mt. Roraima, between Rondon Camp and base of escarpment, alt. 2040–2255 m, 30 Sep 1944, *Steyermark 58982* (F, NY); Ptarí-tepuí, alt. 1800–1900 m, 2 Nov 1944, *Steyermark 59798* (F); base of Mt. Roraima, *Ule 8646* (G, K, type collection of *Diomma ulei* Engler ex Harms).

Like most of the other species of this alliance in Guayana, *S. ulei* is poorly known, but it is perhaps most nearly related to *S. fruticosa*. The latter differs in the shape of its fruit, in the length of its pedicels, and in the distribution of the glandular punctae in the leaflets.

In the fragment envelope of the Geneva specimen of the type collection there is a young fruit which is quite different in form from those described by Harms

and from the one complete, mature one in that envelope. The atypical fruit is probably from another plant and in fact is similar to the fruits of *S. fruticosa.*

3. Spathelia chimantaensis Cowan and Brizicky, sp. nov. Fig. 1, g–i.

Arbor 5–10 m alta, haud ramificata, foliis trunci ad summum congestis, apice juvenili dense puberulo, glabrescenti. Petioli 10–13 cm longi, puberuli sed glabrescentes, basim versus canaliculati sed apicem versus plani, foliorum lamina ca. elliptica, rhachi 30–45 cm longa. Foliola ca. 25–40, alterna ad subopposita, coriacea, petiolulis 3–4 mm longis; laminae leviter arcuatae, mediales 12 cm longae, 3.5–4 cm latae, oblongae vel oblongo-ellipticae, ad basim inaequilaterales, latere superiore rotundato, latere inferiore acuto, apicaliter obtuse acutae, supra glabrae, infra leviter ad costam puberulae. Inflorescentiae terminales, paniculatae, ad 1 m longae, axibus puberulis, bracteis persistentibus, foliaceis, stipitatis, 9–45 mm longis, bracteolis minutis, pedicellis 1.5–2.5 mm longis, puberulis et minutissime stellato-pubescentibus. Sepala 1.5–1.7 mm longa, 1–1.2 mm lata, ovalia, minute ciliolata; petala 5.5–6 mm longa, 2.5 mm lata, concava, elliptico-obovata, ad basim cuneata, glabra. Staminorum filamenta (in floribus masculinis) 4–4.7 mm longis, parte basali alata, alis ca. 2 mm longis, ad apicem bidentatis, ciliolatis, plus minusve villosulis; ovarium in floribus masculis parvum, rudimentarium gynophorium breve, crassum, subcylindricum vel subglobosum, 1–1.5 mm diametro, dense puberulum insidens, in floribus femineis; nondum expansis) late ovoideum, lateraliter compressum, glabrum, 1.8–2.2 mm longum et 1.2–1.8 mm latum in basi extrema brevi paulo attenuata nectaria 4 (5?), parce puberula gerens; stigma in floribus femineis majusculum, bilobum, lobis capitatis; stylus ca. 0.3–0.4 mm longus. Fructus oblatus, glaber, 2.5–3 cm longus, 4–4.3 cm latus, ad pedicellum valde cordatus, ad apicem acutus, corpore late ovato, alis coriaceis.

VENEZUELA: Bolívar: Chimantá Massif, Torono-tepuí; "tree 5–6 m, occasional. Calyx brick with pale green; petals white; filaments greenish white; anther golden; ovary dull madder with pale green stellate hairs. South-facing forested slopes above valley of South Caño, on summit," alt. 1955–2090 m, 23 Feb 1955, *Julian A. Steyermark & John J. Wurdack 1099* (holotype, NY); same data and collectors *938* (paratypes, NY, US); Chimantá Massif, Apácara-tepuí, 19 June 1953, *Steyermark 75699* (paratypes, F, NY).

The differences that separate this species from *S. neblinaensis* are not striking, with the exception of the fruiting ones: the fruits are quite dissimilar in size, shape, and vestiture. The two species also differ in size and shape of leaflets.

4. Spathelia neblinaensis Cowan & Brizicky, sp. nov. Fig. 1, e–f.

A *S. chimantaensi* rhachi longiore (47–57 cm), foliolis medialibus longioribus et angustioribus (14 cm longis, 3–3.3 cm latis), oblongo-lanceolatis, ad apicem arcuato-acuminatis, bracteis primariis caducis, petalis latioribus (4 mm), fructu obovato-oblato, 2 cm longo, 3 mm lato, dense puberulo, apicaliter truncato differt. Flores femineos non vidimus.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua; "Tree 7 m. Fruit green. Occasional in *Bonnetia* scrub forest at northwest head of Cañon Grande, alt. 2000 m, summit," 8–9 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42329* (holotype, US No. 2267446–2267447); same data and collectors *42315* (paratypes, NY, US).

In flower the two new species are not easily separable; only the larger, somewhat differently shaped leaflets and the longer leaf rachises are reliable characters at this stage. Fruiting specimens, however, are easily distinguished by the differences in size, shape, and vestiture of the fruits.

Spathelia Subg. 3. **Sohnreyia** (Krause) Cowan & Brizicky, stat. nov.
Sohnreyia Krause, Notizbl. Bot. Gart. Mus. Berlin **6**: 147–149. 1914.

Only a single species has been described thus far in this subgenus; since its original description, several additional collections have been made and these furnish the primary basis for the following characterizations.

1. **Spathelia excelsa** (Krause) Cowan & Brizicky, comb. nov. Fig. 1, j–m.
Sohnreyia excelsa Krause, Notizbl. Bot. Gart. Mus. Berlin **6**: 148. 1914.

Tree 10–20 m tall, the stem tip minutely puberulous. Leaves 30–54-foliolate, the leaflets with scattered glandular punctae, the petioles to 14 cm long, canaliculate, deeply so at the base, minute puberulous, the rachis to about 2.5 m long, puberulous, the leaflets subopposite to alternate, the petiolules 2–6 mm long, minutely puberulous, the blades of the median leaflets 23–30 cm long, 3.5–5.5 cm wide, narrowly oblong to lanceolate-oblong, slightly arcuate, the base strongly inequilateral with both sides rotund or the upper side subobtuse, the apex acuminate with the tip blunt, the costa and 20–30 pairs of primary vein-branches plane on the upper surface, salient beneath. Inflorescence to 3 m long, the axis densely puberulous, the primary bracts foliaceous, narrowly elliptic, ca. 20 mm long, 5 mm wide, the secondary bracts narrowly triangular, about 1 mm long, the bracteoles minute, the pedicels 1–3 mm long, puberulous. Sepals rotund to broadly ovate, 1–2 mm long and wide, sparingly puberulous externally, ciliolate minutely; petals elliptic, obtuse, glabrous, 4–6 mm long, 2–3 mm wide. Filaments (in pistillate flowers) 2–4 mm long, the basal 1–2 mm alate, the wing bidentate and densely villose, shortly free at the apex from the subulate, apical portion of the filament. Ovary oval, 1.5–3 mm long and wide, glabrous, the stigma sessile, the gynophore 1–2 mm long, densely puberulous. Fruit very broadly oblate, cordate basally, 2.5–3.5 cm long, 4.5–6 cm broad, glabrous, the seed-bearing portion ca. 8 mm long, 5 mm broad.

BRAZIL: Amazonas: Manáos, Estrada do Paredão, 13 Feb 1943, *Ducke 1180* (NY, US); Oriximiná, bas Trombetas, Pará, Dec 1915, *Ducke 15702* (US); Juruty Velho, Pará, 28 May 1927, *Ducke 20472* (US).

The conspicuous gynophore, the sessile stigma, and the shape of the fruit separate this species from its relatives in the other subgenera. In the shape of the fruit and the distribution of the glandular punctae in the leaflets *S. excelsa* is most similar to *S. fruticosa*.

Literature Cited

In addition to the references given in the body of this paper, the following were also consulted:

Alaín, *Hermano* (**E. E. Liogier**). La flora de Cuba: sus principales características, su origen probable. Revista Soc. Cub. Bot. **15**: 36–59, 84–96. 1958.

Harms, H. Ueber die gattung *Diomma* Engler. Notizbl. Bot. Gart. Mus. Berlin **11**: 282–284. 1931.

Leon, *Hermano* (**J. S. Sauget**) & **Alaín**, *Hermano* (**E. E. Liogier**). Flora de Cuba **2**: 389–392. 1951.

Marie-Victorin, *Frère*. Nouvelles études taxonomiques sur la flore de Cuba. III. Le genre *Spathelia* (Rutacées), avec description de cinq espèces et d'une variété nouvelles. Contr. Inst. Bot. Univ. Montréal **63**: 14–48, 76. 1948.

Schuchert, C. Historical geology of the Antillean-Caribbean region. i–xxvi, 1–811. 1935.

Simpson, G. G. Mammals and land bridges. Jour. Wash. Acad. Sci. **30**: 137–163. 1940.

Wilson, P. Notes on Rutaceae—VI. Species of *Spathelia*. Torreya **11**: 262–264. 1911.

APR. 1960 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN 10(2):65–117

ANATOMY OF GUAYANA XYRIDACEAE: ABOLBODA, ORECTANTHE, AND ACHLYPHILA

SHERWIN CARLQUIST

Claremont Graduate School, Rancho Santa Ana Botanic Garden, Claremont, California

The discovery of exceptionally interesting new entities referable to *Xydridaceae* in the Guayana Highland by Maguire and his colleagues (Maguire, Wurdack et al. 1958, 1960) has led to a reappraisal of the limits of the family and its relationships within the monocotyledons. On another level, there are problems of generic and specific differences and relationships and their evolutionary implications. Anatomical studies are important aids in solving these problems. Dr. Maguire, who has organized studies on these taxa, has recognized the helpfulness of anatomical data and has provided me with an excellent collection of suitable material. I should like to express sincerest appreciation to him for his gratifying interest in the studies recounted below, his generous sharing of material with me, and his invitation of this contribution. Of particular significance is the fact that the writer reached the conclusions set forward at the end of this paper on the basis of anatomical material alone. Dr. Maguire and I exchanged manuscripts when our studies were completed so that we could take advantage of each other's findings in a final presentation, but the great similarity in our conclusions, based on different methods of study, derives from the fact that anatomical features show the same patterns of likeness and diversification with reference to the taxonomic system as do features of gross morphology. I acknowledge with pleasure Dr Maguire's interest in my independent development of such facts, and his use of these when they became available to him. If there had been any major divergences of opinion, we should have exposed these and attempted to resolve them, but in fact, no such disagreements in interpretation of materials did occur.

MATERIALS AND METHODS

Both liquid-preserved and herbarium materials were given to the writer. Herbarium material was treated with warm 2.5 per cent aqueous NaOH to expand it to its natural proportions, washed, and stored in 50 per cent ethyl alcohol. Both liquid-preserved and treated herbarium material were embedded, sectioned, and stained according to the techniques described earlier by the writer (1958). Pollen preparation techniques are described below in connection with that topic.

The specimens studied are listed below. All specimens are represented by a mounted collection in the New York Botanical Garden Herbarium. Taxa recognized correspond with those of Maguire, Wurdack, et al. (1958, 1960).

Liquid-preserved, assorted parts: *Abolboda acaulis* Maguire, *Maguire & Politi 27700, Maguire 32820, Maguire 33730, Maguire et al. 40669; A. acicularis* Idrobo & Smith var. *acicularis, Maguire et al. 41439; A. americana* (Aublet) Lanjouw, *Maguire et al. 41537; A. ciliata* Maguire & Wurdack, *Maguire et al. 42420; A. linearifolia* Maguire, *Maguire et al. 41680; A. macrostachya* Spruce ex Malme var. *angustior* Maguire, *Maguire et al. 41541; A. macrostachya* Spruce ex Malme var. *macrostachya, Maguire et al. 41446; A. macrostachya* Spruce ex

Malme var. *robustior* Steyermark, *Maguire et al. 28176; A. sprucei* Malme, *Maguire et al. 41721; Achlyphila disticha* Maguare & Wurdack, *Maguire et al. 42402; Orectanthe sceptrum* (Oliver) Maguire subsp. *occidentalis* Maguire, *Maguire et al. 40567.*

Liquid-preserved, pollen only: *Abolboda bella* Maguire, *Maguire et al. 34514; A. ebracteata* Maguire, *Maguire et al. 30467; A. grandis* Grisebach var. *quayanensis* Maguire, *Maguire et al. 27561; A. macrostachya* Spruce ex Malme var. *angustior* Maguire, *Maguire et al. 36342; A. macrostachya* Spruce ex Malme var. *robustior* Steyermark, *Maguire et al. 28176; Orectanthe ptaritepuiana* (Steyermark) Maguire, *Maguire et al. 32823, Steyermark & Wurdack 523, Steyermark & Wurdack 1221; O. sceptrum* (Oliver) Maguire, *Maguire et al. 40567, Maguire et al. 33180.*

Dried materials, assorted portions: *Abolboda macrostachya* Spruce ex Malme var. *macrostachya*, *Maguire et al. 39957; A. macrostachya* Spruce ex Malme var. *robustior* Steyermark, *Maguire et al. 28176; Orectanthe ptaritepuiana* (Steyermark) Maguire, *Maguire 32766, Maguire 32823, Steyermark & Wurdack 908; O. sceptrum* (Oliver) Maguire, *Maguire et al. 33342, Maguire et al. 40567; O. sceptrum* (Oliver) Maguire subsp. *occidentalis* Maguire, *Maguire & Politi 28451.*

ANATOMICAL DESCRIPTIONS

ROOT

Solereder and Meyer (1929) summarize the work of Nilsson, Poulsen, and Malme, as well as their own, on root anatomy of *Xyridaceae*. Although their data apply chiefly to *Xyris*, with only a few references to *Abolboda*, they provide a framework for the expression of data. Almost every character they cite is represented by a number of *Xyris* species, and detailed mention of these, other than acknowledgment of occurrence of those characters in *Xyris*, is unnecessary here.

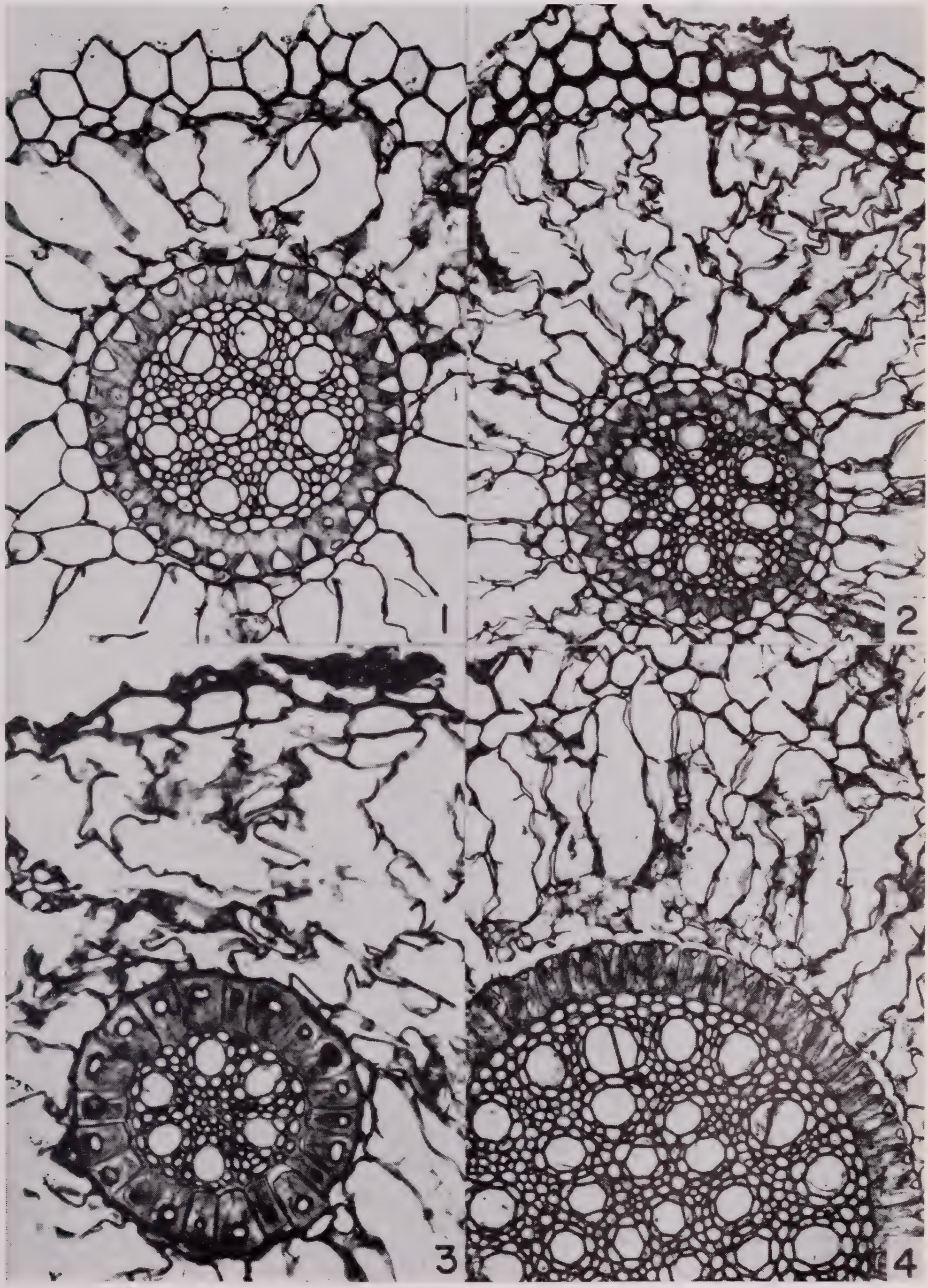
Certain characteristics, on the basis of the present study, appear to be of greater value than others for systematic purposes. Characters which appear relatively reliable in this respect include:

(1) Presence of a continuous pericycle, as opposed to its interruption by vessels.

(2) Shape and thickening of endodermis cells.

(3) Number of vessels present in the vascular core (only insofar as the number is relatively large or small; a certain variation in the number of xylem poles is always present.

Other characteristics, such as the relative extent of the cortex, may have some significance. Solereder and Meyer (1929) follow Nilsson in discriminating between ordinary roots and mechanical roots. This contrast is probably more one of degree than of kind. In the present study, the roots of *Achlyphila disticha* (fig. 7) might be said to be mechanical roots on account of their sclerenchymatous vascular core in which phloem is minimal. The presence of sclerenchyma in the core, with small scattered patches of phloem cells, suggests such a designation for the roots of *A. linearifolia* (fig. 2) described below, but their difference from other roots is relatively minor. Likewise, the roots of *A. sprucei* and *A. macrostachya* might bear such a designation, and Solereder and Meyer place roots of the latter species in that category, along with *A. longifolia.*



FIGS. 1–4. Portions of transections of roots of *Abolboda*, each with the vascular core below and the cortex and exodermis above. FIG. 1. *A. sprucei*. × 166. FIG. 2. *A. linearifolia*. × 155. FIG. 3. *A. acaulis*. × 245. FIG. 4. *A. macrostachya* var. *macrostachya*. × 143.

The figure by Malme (1925) of *A. vaginata* shows much greater sclerification of the vascular core than any of the species in the present study, so that this species should probably be mentioned in this regard. In only a few instances (*Abolboda acaulis, A. americana*) were relatively large phloem groups, distinctly alternate with xylem poles, observed. The roots studied here differ little in structure of the cortex, which consists of large cells associated with relatively small intercellular spaces. This condition is reported for *Abolboda vaginata* and the species of *Xyris* section *Xyris* by Solereder and Meyer. There are, in roots of *Abolboda sprucei* and *A. americana*, occasional groups of stellate parenchyma cells in the cortex. This condition is mentioned by Solereder and Meyer for *Abolboda vaginata* and a number of species of *Xyris*. The walls, especially the inner, of the hypodermis and sometimes the adjacent walls of the subhypodermal layer are thickened in all the species studied here (figs. 1,2,7). Very light thickenings were noted in the hypodermal layer of *A. americana* and *A. macrostachya* var. *macrostachya* (fig. 4, upper right). Hypodermal thickenings, making possible the designation of an "exodermis," were noted by Solereder and Meyer in *Xyris indica* and *X. lanata*.

Abolboda.

1. *A. acaulis.* Endodermal cells in this species (fig. 3) are very thick-walled, with a small lumen which is nearer the outer than the inner surface of the endodermis. The stele is tetrarch or pentarch; no central vessel is present. The pericycle is unbroken.

2. *A. acicularis* (fig. 6). The endodermis is composed of cells only moderately thicknened on all surfaces. The inner wall is very slightly thicker than the radial or inner wall. Monarch, tetrarch, and 8-arch conditions were observed; in the last-named, a central vessel was present. Interruption of the pericycle by vessels is various, and both a single and all but a single vessel in contact with the endodermis were observed in different roots.

3. *A. americana* (fig. 5). In all the numerous roots examined, comprising several collections, the endodermis was composed of cells the inner walls of which were markedly thickened. This thickening tapers on the radial walls to rather thin at their juncture with the outer walls, on which no thickening is present. The following stelar conditions were observed: 2-, 3-, 4-, 5-, and 6-arch. All vessels are in contact with the endodermis, with the occasional exception of one or two.

4. *A. linearifolia* (fig. 2). The walls of the endodermal cells are thickened in a U-shaped manner, but thickenings on the radial walls are tapered abruptly to their point of contact with the exterior walls. A ring of parenchyma cells with noticeable thickenings ensheaths the endodermis. The stele is 7- or 8-arch, with one or two central vessels. Phloem groups are small and scattered; cells of the stele other than vascular elements are thick-walled. The pericycle is not interrupted by vessels.

5. *A. macrostachya* var. *macrostachya* (fig. 4). The root observed possessed endodermal cells much more radially elongate than those of the preceding ones. The walls are markedly thickened, with the lumen quite eccentrically placed toward the exterior side of the cells. The stele is very large, and the root observed was 15-arch, with 15 central vessels. Phloem groups are small and scattered throughout the stele. The pericycle is not interrupted by vessels.

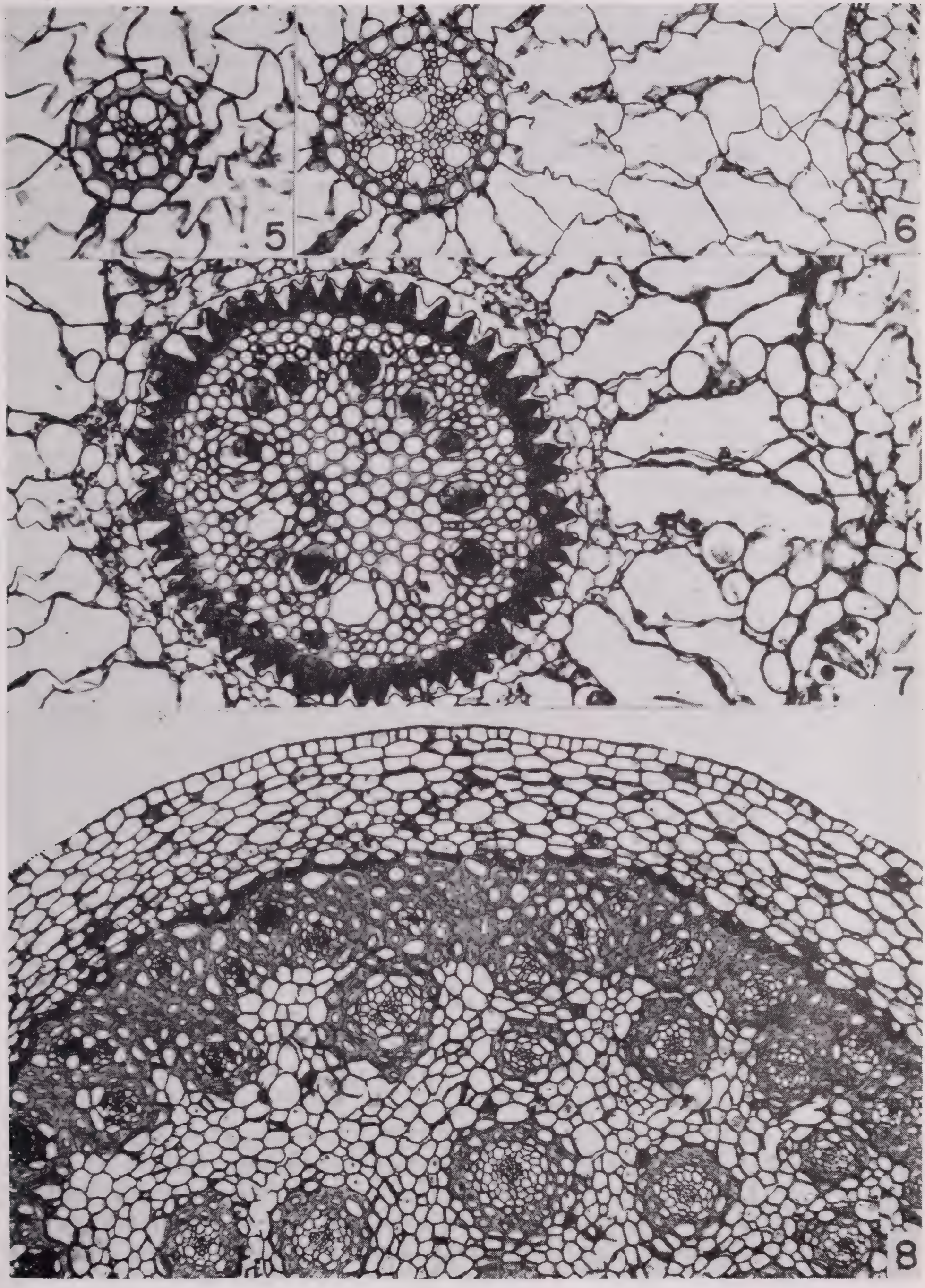


FIG. 5. *Abolboda americana*, transection of vascular core of root. × 286. FIG. 6. *Abolboda acicularis* var. *acicularis*, transection of root, showing cortex and exodermis at right. × 127. FIG. 7. *Achlyphila disticha*, transection of root showing cortex and exodermis at right. × 157. FIG. 8. *Achlyphila disticha*, transection of rhizome, exterior above. × 70.

6. *A. macrostachya* var. *robustior*. The roots observed in this variety are similar to those of the above variety, but diver in the following respects. Two, rather than one, exodermis layers are present. The parenchyma sheath around the endodermis is two cells wide at points. The two roots observed were 13-arch with 18 central vessels and 15-arch with 16 central vessels respectively. The central vessels cannot be differentiated from the peripheral ones at all points.

7. *A. sprucei* (fig. 1). The cortex of roots of this species is quite distinctive in consisting of only two cell layers internal to the exodermis. The outer of these layers is composed of quite large cells, the inner of smaller cells which ensheath the endodermis. Plates of small arm-parenchyma cells interrupt this condition in places. The endodermis consists of cells thickened in a peculiar fashion, so that the lumen is turbinate as seen in transectional outline. Rarely, the endodermis is two-layered (two such instances are seen in figure 1) to the extent of one or two pairs of cells per stele. The root examined was 7-arch with a central vessel. The pericycle is not interrupted by peripheral vessels.

Achlyphila.

In respect of exodermis and cortex structure, the root of *Achlyphila disticha* (fig. 7) conforms to the pattern outlined above. The endodermis, which stains bright orange-red (rather than pink, as in *Abolboda*) with safranin, possesses U-shaped thickenings not exactly like any mentioned above. The endodermis may be two cells wide in places, although this condition is rare and localized. Two roots examined proved to be 11-arch and 13-arch respectively. No central vessels are present. This is surprising in view of the large diameter of the vascular core. Instead, one to several cells that have the wall-thickening and staining characteristics of endodermis cells (figure 7, dark area in center of vascular core) are present in this position. On account of their characteristics, they probably should be regarded as endodermal cells, despite their location. Phloem groups are extremely small and are scattered among the sclerified cells of the vascular core. The pericycle is not interrupted. Significantly, there are two or three layers of cells (as compared to fewer in *Abolboda*) between the pericycle and the outermost vessels. Occlusion by tannin-like materials is characteristic of many vessels.

Orectanthe.

No roots of *Orectanthe* were available for study.

Vessels.

For each of the above species, serial longitudinal sections were prepared to show the presence of vessels. All the species described above proved to have true vessel elements with simple perforation plates. Vessels have been reported by Solereder and Meyer (1929) in roots of *Xyris lacera*, *X. lanata*, and *X. indica*. Likewise, Cheadle (1942) indicates vessels with simple perforation plates for roots of *Xyris flexuosa* and *X. smalliana*.

Discussion.

The species of *Abolboda* described here offer no features not previously mentioned by Solereder and Meyer for *Abolboda* or *Xyris*. The possibility that endodermis-cell characteristics could be used as specific characteristics, suggested by Malme in 1925, appears to be valid. Malme shows very thick-walled endodermal cells with centrally placed lumina for *A. pulchella* and *A. vaginata*. He reports prominent thickenings on the inner wall, tapering sharply on the radial walls, and absent on the outer walls, for endodermal cells in roots of *A. poeppigii*, *A. grandis*, and *A. macrostachya*. Malme's figure for *A. macrostachya* is markedly different from the condition illustrated here for that species. The endodermal cell thickenings Malme reports for *A. poarchon* and *A. abbreviata* are like those illustrated in the present study for *A. acicularis*.

Interestingly, Malme's figures all show an uninterrupted pericycle (*A. vaginata*, *A. macrostachya*, *A. poarchon*). The species of *Abolboda* in the present study in which uninterrupted pericycle was observed all belong to the group termed "larger-stemmed abolbodas" in sections below. Malme's figures also suggest a larger number (six or more) of xylem poles, a feature also characteristic of the group just named. Thus as Malme (1925) claims, different types of root anatomy in *Abolboda* appear to be characteristic of species or species-groups; from the example of *A. sprucei* described above, one may surmise that such characters are not always limited to the stele, but may be found in the cortical zone as well.

The several layers of cells between endodermis and outermost vessels, the absence of central vessels, the presence of endodermis-like cells in their place, and the distinctively staining endodermis thickenings are characteristics which, taken together, would seem to give the roots of *Achlyphila* a generic differentiation from the other three genera. In fact, some of these characteristics seem new to *Xyridaceae*, although the sum of characteristics in this genus would not exclude it from the family.

On the basis of the present study, one may conclude that the roots of *Abolboda* offer no anatomical features (other than greater size, and therefore more numerous vessels) which cannot also be found in *Xyris* roots, as the account of Solereder and Meyer (1929) illustrates.

STEM

As the summary of Solereder and Meyer shows, remarkably little is known about stem anatomy in *Xyridaceae*. The only facts that have been established are that bundles are amphivasal, individual bundles may be sheathed with sclerenchyma (incompletely in *X. lanata*), and that (in *X. lanata*) the bundles may form concentric bands. As an additional generalization, the writer would like to add the fact that in all taxa he examined, vascular bundles tend to be more or less amphivasal except where they are demarcated as leaf traces, in which case the structure of the bundles tends to be more nearly collateral.

The data given below are derived from study of mature portions of rosette stems, except for *Achlyphila*, which has a rhizomatous habit. At and near the base of a stem, especially in the smaller-stemmed species of *Abolboda*, departing roots may be numerous in the cortex, and the vascular bundles may form a very small group in the center of the stem. In *A. americana*, no part of the stem (except the very youngest) was free from departing roots. The types of stem anatomy observed in the *Xyridaceae* under study here fall into four main groups.

Smaller–stemmed Abolbodas.

The four species, *A. acaulis* (fig. 9), *A. acicularis* (fig. 10), *A. americana*, and *A. ciliata* (fig. 11), that are considered under this category show four features: (a) the bundles other than those that are leaf traces are most often enclosed in a sclerenchyma cylinder; (b) sclerenchyma ensheaths departing leaf traces individually; (c) the ground tissue of the stem (other than sclerenchyma) consists of more or less spongy tissue lacking in starch; and (d) the bundles (except leaf traces) are present in a cylinder and no bundles are present in the central portion of the stem. The variations on this pattern are as follows.

1. *A. acaulis* (fig. 9). In this species, departing leaf traces are most often incompletely sheathed with sclerenchyma; such sclereids are few or absent at the outer (phloem) pole. Centrally placed in the core of parenchyma is a nest of sclereids. This nest of sclereids occurs along the length of the stem, and is present even in the most basal region, where other sclerenchyma is wholly lacking.

2. *A. acicularis* (fig. 10). The central portion of the stem, including bundles other than leaf traces, is sclerified. Sclerenchyma forms a conspicuous sheath around leaf traces; it is more abundant at the xylem pole of each bundle. The bundles other than leaf traces form a single ring. Sclerenchyma may form a cylinder, as illustrated, may occupy the entire central portion of the stem, or may, as illustrated for *A. acaulis*, form a nest within the ring of bundles. The latter condition occurs in the base of the stem, and the cylinder is characteristic of the upper portion of a stem.

3. *A. americana*. Sclerenchyma (other than that which forms a cylinder in the center of the stem) is present only at the xylem pole of departing leaf traces.

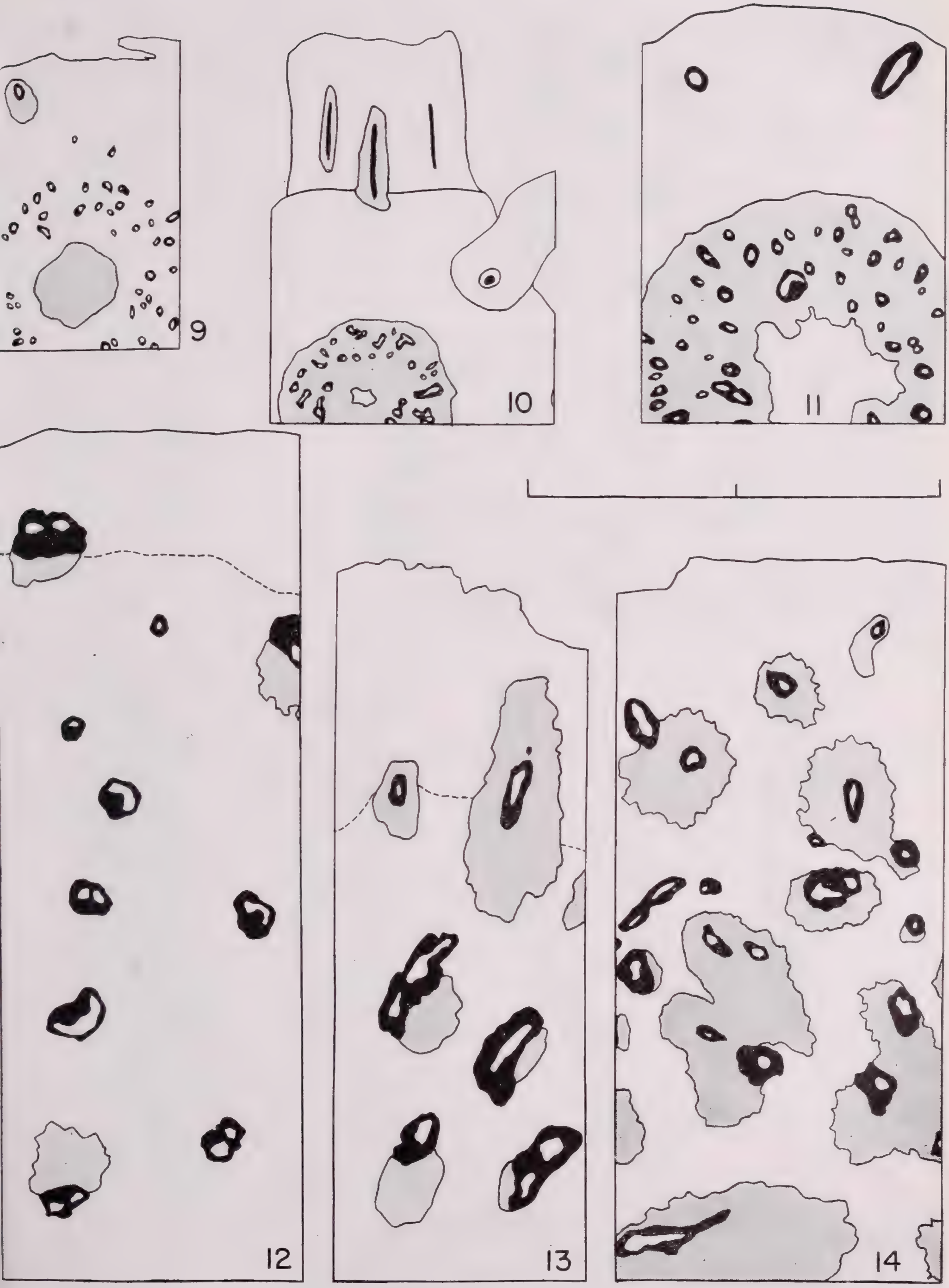
4. *A. ciliata* (fig. 11). This species shows essentially the same features as *A. americana*, although the stem is somewhat larger.

Larger–stemmed Abolbodas.

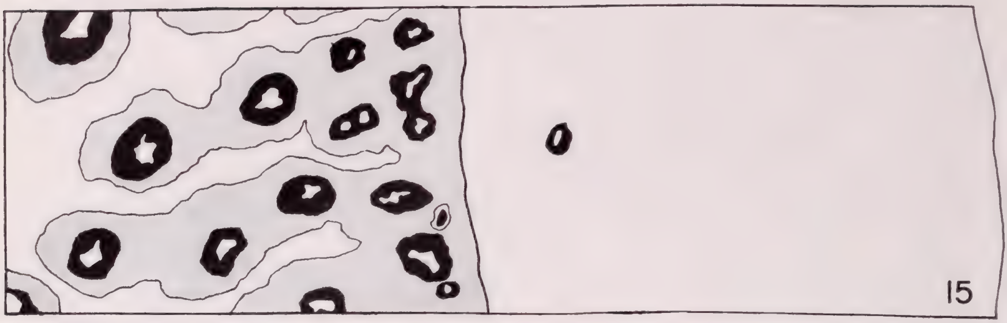
This group includes *A. linearifolia* (fig. 12), *A. macrostachya* and its varieties (fig. 13, var. *angustior*), and *A. sprucei* (fig. 14). These species agree in possessing (a) much wider stems than species of the above group; (b) no sclerenchyma other than individual sheaths on bundles; (c) compact, never spongy ground tissue, often differentiated into a starch-poor zone outside and an inner core (figs. 12, 13, inside dotted lines) which contains numerous elongate starch grains; and (d) bundles throughout the central portion of the stem, more numerous in a cylinder just inside the outer limit of starch-rich tissue. In all preparations, the ground tissue consists of more or less isodiametric cells associated with relatively small intercellular spaces. Starch may be expected to vary in amount depending on the state of development of the plant. Variations with respect to species are as follows.

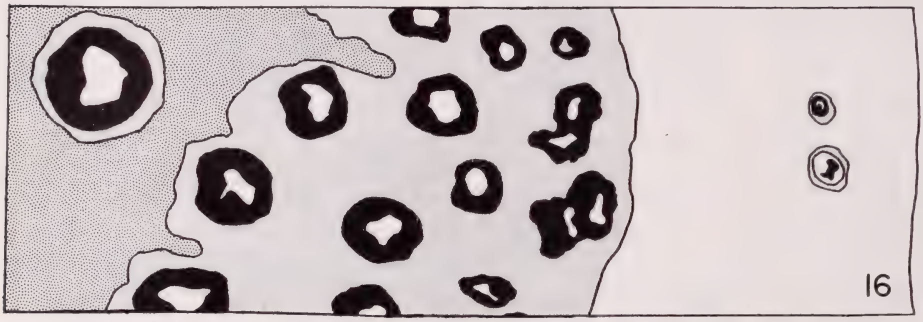
1. *A. linearifolia* (fig. 12). Many of the bundles lack sclerenchyma. Where present, it takes the form of a semicircle at the interior pole of the bundle. Sclerenchyma is associated with the larger bundles, and may be an indication of major bundles which enter leaves a short distance above the level of sectioning.

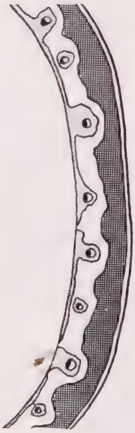
2. *A. macrostachya*. In *A. macrostachya* var, *macrostachya* and var. *robustior*, the same condition described for *A. linearifolia* was observed. In *A. macrostachya* var. *angustior* (fig. 13), however, all bundles were found to be associated with sclereids, which may be quite abundant near some bundles. Some leaf traces are completely ensheathed by such sclerenchyma.

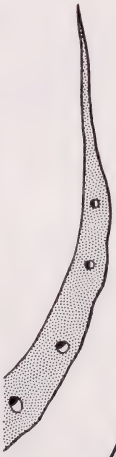


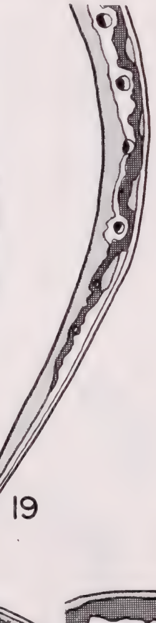
FIGS. 9–14. Portions of transections of rosette stems of *Abolboda,* exterior above, patterned to show distribution of various tissues. FIG. 9. *A. acaulis.* FIG. 10. *A. acicularis* var. *acicularis;* leaf base in paradermal section, above; endogenous root at right. FIG. 11. *A. ciliata.* FIG. 12. *A. linearifolia.* FIG. 13. *A. macrostachya* var. *angustior.* FIG. 14. *A. sprucei.* Broken line in figures 12, 13 delimits the outer starch-poor region from the inner starch-rich zone. Patterns as follows: stippled = sclerenchyma; white inside bundles = phloem; black = xylem; parenchymatous ground tissue left bank. Scale = 2 mm. in 1 mm. divisions.

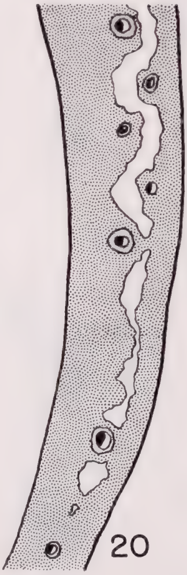

15

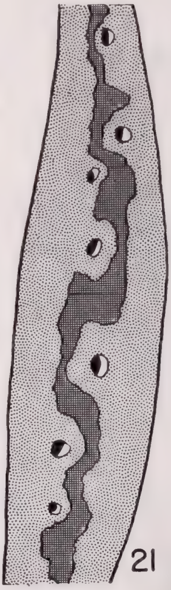

16

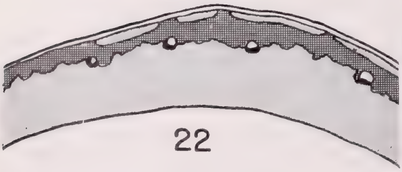

17

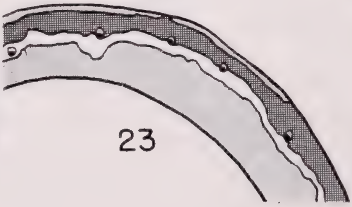

18

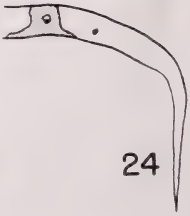

19


20


21


22


23


24

3. *A. sprucei* (fig. 14). All bundles are associated with abundant sclerenchyma sheaths, with few exceptions. Such sclerenchyma may in fact incorporate several bundles. Bundles that lack sheaths are frequently transversely oriented and tend to delimit a cortical zone, in which leaf traces are present, from the central zone.

Orectanthe.

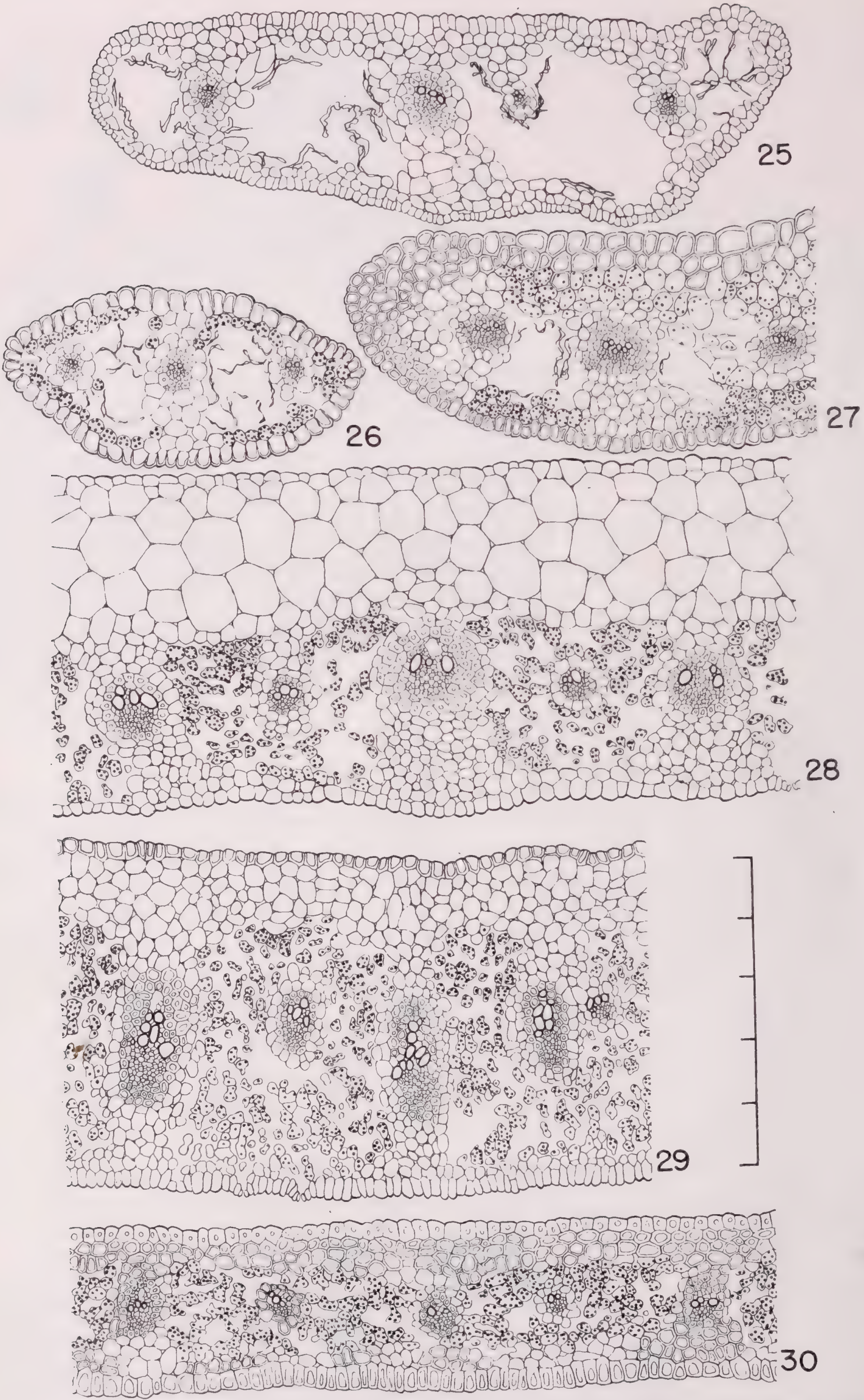
As might be expected, the large stems of *Orectanthe* have an anatomy quite distinct from that of the above species. There is a difference between the pattern found in *O. ptaritepuiana* (fig. 15) and that which was observed in *O. sceptrum* (fig. 16). In *O. ptaritepuiana,* a cortical zone is clearly delimited by a sclerenchymatous cylinder which consists of lignified parenchyma cells. The inner margins of this cylinder are irregular, for some bundles and their sclerenchymatous sheaths are joined to it and others are independent in the thin-walled central ground tissue. Outside of the sclerenchyma cylinder, the parenchyma is also thin-walled. Bundles in this region are smaller than those within the cylinder, and are either lacking in sclerenchyma sheaths or very sparingly provided with such tissue. In *O. sceptrum* (fig. 16) the entire central portion of the stem consists of lignified ground tissue. Wall thickenings are much greater toward the exterior of the sclerenchymatous core. In addition, wall thickenings are greater on the 2–3 layers of cells that sheath bundles in the sclerenchymatous zone. The cortical region consists of non-lignified parenchyma which contains vascular bundles smaller than those encased in the sclerenchyma core. These leaf traces are ordinarily provided with fibrous sheaths which completely encase them.

Achlyphila.

In the single species, prostrate rhizomatous stems are present. Upright stems are formed in connection with production of inflorescences, and these are considered under "Inflorescence Axis" below. The stem described here, therefore, is the rhizome, which differs from rosette stems of *Xyris, Abolboda,* and *Orectanthe* in its long internodes. This rhizome (fig. 8) possesses a marked cylinder of thick-walled sclereids which delimits the cortical region of thin-walled parenchyma cells. The outermost layer of this cylinder consists of cells that are, in their thickening patterns and staining properties, very similar to root endodermis cells. The occurrence of endodermis in rhizomes of monocotyledons is not uncommon, and these cells should be so interpreted here. The inner margins of the sclerenchyma cylinder are irregular in outline. In the central portion of

---

FIGS. 15, 16. Portions of transections of rosette stems, of *Orectanthe,* exterior at right. FIG. 15. *O. ptaritepuiana.* FIG. 16. *O. sceptrum.* Scale for figures 15 and 16 = 2 mm in 1 mm divisions. FIGS. 17–20. Portions of transections of inflorescence-axis bracts, exterior at right. FIG. 17. *Abolboda ciliata,* section midway along length of bract. FIG. 18. *A. macrostachya* var. *macrostachya,* section from tip of bract. FIG. 19. Same, section midway along length of bract. FIG. 20. *A. macrostachya* var. *robustior,* section midway along length of bract. FIG. 21. *Orectanthe sceptrum,* transection of a flattened sepal. FIGS. 22–24. Transections of bracts of inflorescence proper, taken midway along length of bract, exterior face above. FIG. 22. *Abolboda macrostachya* var. *robustior.* FIG. 23. *A. linearifolia.* FIG. 24. *A. americana.* Scale for figures 17–24 = 2 mm in 1 mm divisions. Patterns as follows: fine stippling = thick-walled sclerenchyma. coarser stippling = thin-walled sclerenchyma. cross-hatched = chlorenchyma; white in bundles = phloem; black = xylem; parenchymatous ground tissue left blank.



FIGS. 25–30. Transections of leaves, taken approximately midway along length of leaf, adaxial face above. FIG. 25. *Abolboda americana*. FIG. 26. *A. acicularis* var. *acicularis*.

the stem, bundles are embedded in thin-walled parenchyma. Each bundle in this region is completely ensheathed by lignified cells like those of the sclerenchyma cylinder. Leaf traces are uncommon in the cortical region (on account of the long internodes), but where these are present, each bears a sclerenchyma cap on the xylem face of the bundle. There are occasionally a few thick-walled lignified parenchyma cells in the cortical region.

Discussion.

Despite the fact that the meager literature on stem anatomy does not suggest the usefulness of this organ for systematic purposes, excellent generic and specific characteristics are seemingly present, as outlined above. The smaller-stemmed species of *Abolboda* are distinctive in their lack of central bundles, their sclerenchyma cylinder, and their spongier, starch-free parenchyma, as compared to the larger-stemmed species. The two species of *Orectanthe* are like the larger-stemmed species of *Abolboda* in bundle distribution, but show a prominent lignification of parenchyma; this lignified core is clearly delimited from a thin-walled cortical region. The rhizomatous stem of *Achlyphila* is distinctive in *Xyridaceae,* but is not extremely unlike stems of *Abolboda* in its construction. Features of generic value include its prominent sclerification, distribution of bundles, and development of an endodermis.

Vessels.

Longitudinal sections of stems in all the taxa named above were prepared, and these were used to demonstrate that in all taxa named, vessel elements with simple perforation plates occur. Cheadle (1942) has indicated such vessel elements for two species of *Xyris.*

LEAF

The same groupings used for descriptions of stem anatomy may be used here. The species and species-groups prove highly diversified, so that few generalizations can be offered.

Smaller–stemmed Abolbodas.

Species in this group are distinctive in their smaller leaf size, the relative lack, or restriction of, photosynthetic tissue, and the presence of longitudinally-oriented pockets of parenchyma which collapses at maturity and appears to have been composed, in some instances at least, of chlorenchyma cells. Hypodermis is absent, or present only in the more apical portions of the leaf. Stomata are restricted to the lower surface.

1. *A. acaulis* (figs. 31, 35). The basal portion of a leaf (fig. 31) consists of parenchyma, isodiametric as seen in transectional outline, in which 4–5 veins are embedded. Between the veins, zones of collapsed parenchyma are present. Sclerenchyma completely ensheaths the veins; such sheaths are usually two cells in thickness. At a higher level (fig. 36) a hypodermis begins to be differentiated; it is prominent (by virtue of contrast with chlorenchyma) only in the most apical portions of the leaf, where it consists of gelatinous-walled sclereids,

---

FIG. 27. A. ciliata. FIG. 28. *A. macrostachya* var. *robustior.* FIG. 29. *Orectanthe ptaritepuiana.* FIG. 30. *O. sceptrum* subsp. *occidentalis.* *Scale* = 0.5 mm in 0.1 mm divisions.

at least in places. In the section shown (fig. 36) three main veins, with fibrous sheaths, are present, and chloroplasts are present in the mesophyll parenchyma, although they are rather sparse.

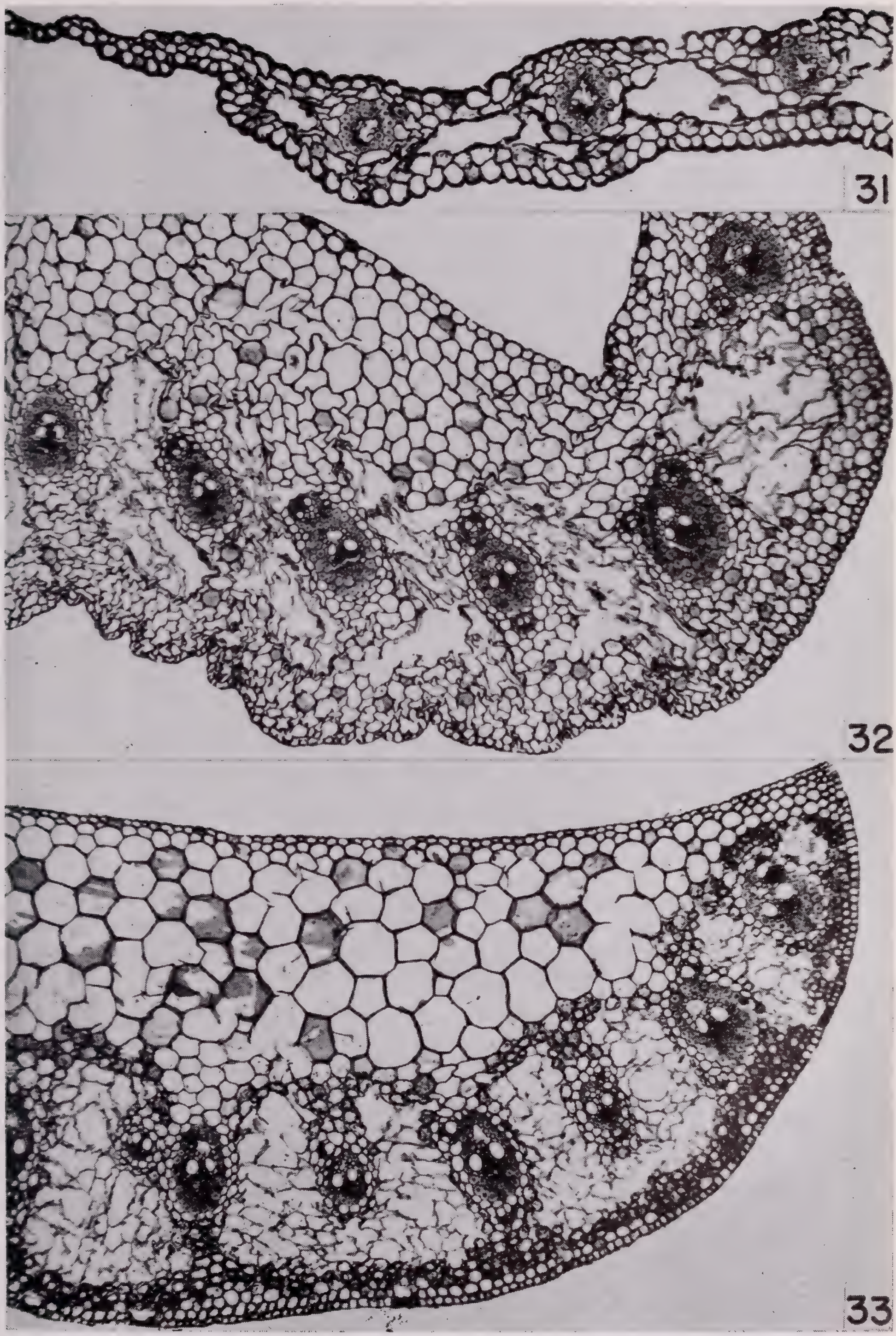
2. *A. acicularis* (fig. 26). Leaves of this species are similar to those of *A. acaulis*. A section approximately halfway along the length of the leaf (fig. 26) reveals three veins, each surrounded by sclerenchyma and embedded in chloroplast-free parenchyma cells isodiametric in transaction. Cells rich in chloroplasts form a layer immediately beneath the epidermis on both surfaces. Between the veins, pockets of collapsed parenchyma cells occur. A thick-walled hypodermis occurs in the most apical portion of the leaf, where the mesophyll is composed of spherical chlorenchyma.

3. *A. americana* (fig. 25). This leaf shows little differentiation from base to apex, except for reduction in number of veins. Especially prominent are the longitudinal zones of collapsed parenchyma. Some of the smaller bundles lie in these zones. All of the bundles are completely ensheathed by sclerenchyma. The parenchyma is composed of cells, isodiametric in transection, with relatively few chloroplasts. These cells may be weakly differentiated as a hypodermis in the adaxial portion of the leaf. The leaves of *A. americana* are certainly within the range of variation of *Abolboda*, but an additional similarity may be noted to leaves figured by Arber (1925) for *Eriocaulon septangulare*.

4. *A. ciliata* (figs. 27, 35). An extensive series of transections of a leaf of this species showed the nature of differences, characteristic of *A. ciliata*, between base and apex. The most basal portion (leaf sheath) consists only of thin-walled parenchyma in which approximately seven bundles, without fibrous sheaths, are embedded. In the upper portion of the leaf sheath, sclerenchymatous sheaths are present and collapsed parenchyma cells occur between veins, resembling the condition shown for *A. acaulis* in figure 31. The margins of the leaf at this level are biseriate. Segments of this wing split off, forming the ''cilia'' implied in the species name. Above the level of the sheath, (fig. 27), the leaf is markedly thicker, lacks tapered margins, and has a hypodermis, one or two cells thick, on the adaxial face of the leaf. The mesophyll (other than the pockets of collapsed cells) consists of spherical cells with numerous chloroplasts. Seven bundles, each surrounded by a sclerified sheath, are present at this level. At higher levels, such as that shown in figure 35, the outermost bundles are not present. At the margins of the leaves, a portion of the hypodermis, which extends around the edges of the leaf toward the abaxial surface, consists of sclerified cells. At this uppermost level, the chlorenchyma cells are differentiated (mostly by relative size of intercellular spaces) into palisade and spongy tissue. The level shown in fig. 35 is notable for the greater thickness of the leaf, a thickness due not only to the greater number of hypodermis layers, but to the greater number of chlorenchyma layers as well.

Larger-stemmed Abolbodas.

Despite certain distinctive features in the leaf of *A. linearifolia*, there is agreement among *A. linearifolia*, *A. macrostachya*, and *A. sprucei* in the following respects: leaves thicker and larger than those of the above group; hypodermis present, consisting of 3–5 layers of cells; parenchyma like that of the hypodermis (polygonal in transection, markedly elongate in longitudinal section) also present and bundle sheaths (surrounding fibrous bundle-sheath layers)



Figs. 31–33. Transections of leaves of *Abolboda*, adaxial face above. Fig. 31. *A. acaulis*, section taken toward base of leaf. × 80. Fig. 32. *A. linearifolia*, section taken toward base of leaf. × 65. Fig. 33. The same, section taken midway along length of leaf; margin at right. × 65.

and bundle-sheath extensions; the remainder of the parenchyma being either of globular chlorenchyma cells or collapsed parenchyma cells.

1. *A. linearifolia* (figs. 32, 33). In the basal portion of the leaf (fig. 32) there is a large number of vascular bundles. These alternate with pockets of collapsed tissue. Most significant is the fact that veins occur as bundle-groups. Most of the veins are thus compound, and consist of 2–3 bundles. This condition is unique in *Abolboda*, and proves an exception to the statement of Solereder and Meyer (1929) that the bundle-group type of construction in *Xyridaceae* is restricted to *Xyris*. Each bundle in the bundle-groups is surrounded by a fibrous sheath which is fused with the sheaths of neighboring bundles in the group. At a higher level (fig. 33) the same type of bundle is evident. There are, as described for *A. ciliata*, marginal hypodermal fibers, and the hypodermis other than this consists of about five cell layers. Bundle-sheath extensions are present, but relatively infrequent—only 1–3 may be present in a section at this level. The remaining mesophyll consists of spherical chlorenchyma cells which occur beside the hypodermis, lower epidermis, and around the bundle sheaths. Mesophyll not adjacent to these areas consists of collapsed parenchyma cells. The structure of leaf-tips is considered below in a separate section.

2. *A. macrostachya.* The sheathing portion of the leaf of *A. macrostachya* var. *macrostachya* (fig. 34) is like that described for *A. linearifolia* in the nature of chlorophyll-free and collapsed parenchyma distribution. It is thinner, however, and the bundles, which are not grouped, possess massive sclerenchyma bundle sheaths. At upper levels in the leaf of *A. macrostachya* var. *robustior* (fig. 28) a hypodermis of 3–4 layers occurs. Bundle sheath extensions consist of cells similar to the hypodermis and are present on all but the smallest veins. The remaining mesophyll consists of chlorenchyma, more densely arranged toward the adaxial surface. Only the larger veins have lignified elements in the bundle sheath; these are more abundant on the abaxial faces of the bundles. In comparable portions of the lamina of *A. macrostachya* var. *macrostachya* and var. *angustior,* which are much alike in leaf anatomy, only 1–3 bundle sheath extensions are present. Fibrous bundle sheaths generally are complete in var. *angustior*, whereas they often are present only along the abaxial surface of veins in var. *macrostachya.* In other respects the three varieties are alike. Structure of the leaf tips is described below.

3. *A. sprucei* (fig. 37). The sheath portion of the leaf in this species is like that shown for *A. macrostachya* (fig. 34) and requires no further comment. The upper portion of the lamina in *A. sprucei* (fig. 37) also shows similarity to that of *A. macrostachya.* A hypodermis 2–5 cell layers wide is present, and no marginal sclerenchyma occurs. The remaining mesophyll consists of globular chlorenchyma cells which are more densely arranged beneath the hypodermis. The bundle sheath of all veins, in addition to the outer layer of chlorophyll-free parenchyma, consists of a massive fibrous sheath.

4. *Leaf-tip.* The three species above are alike in having a thorn-like terminus which occupies the 1–2 mm at the leaf apex. This type of apex in itself is not exceptional, nor is the fact that xylem alone without phloem composes the terminal portion of the vein, for this condition has been reported in other monocots (Arber, 1925). The tracheids in these species (fig. 41) tend to be separated from each other by parenchyma cells. The genuinely remarkable feature concerning these tracheids is the presence of very wide bands which

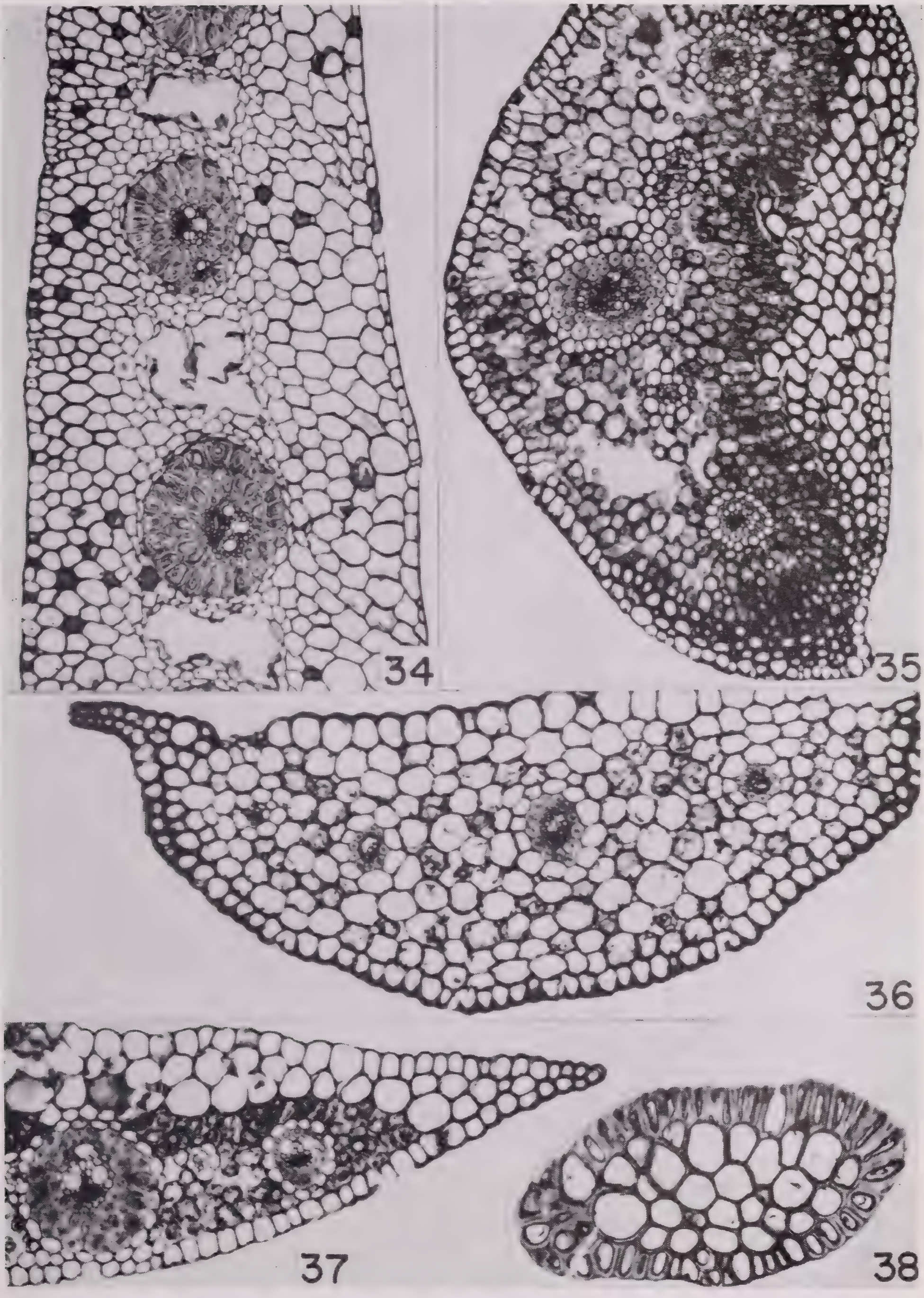


FIG. 34. *Abolboda macrostachya* var. *macrostachya*, transection of leaf base, adaxial face at right. × 74. FIG. 35. *A. ciliata*, transection of upper portion of leaf, adaxial face at right; margin below. × 90. FIG. 36. *A. acaulis*, transection of upper portion of leaf; margin at left, adaxial face above. × 123. FIG. 37. *A. sprucei*, portion of transection taken midway along length of leaf; margin at right, adaxial face above. × 108. FIG. 38. *A. sprucei*, transection of ovary crest. × 108.

form the helical wall thickenings (fig. 41, enlarged in fig. 40). These bands, which are homologous with the typical helical or annular bands on protoxylem tracheids, are up to half the lumen in width. In helical tracheids more than one helix (usually two) may be present per tracheid. The bands are thicker toward the center of the cell, reflecting a "bordered" condition, as seen in figure 40, left. As seen in a transection of the leaf tip (fig. 42), the tracheids appear like fibers, because the wide bands resemble the thick walls of fibers. There seems little doubt that these represent specializations of ordinary annular and helical protoxylem tracheids. The transition to them from normal tracheids is abrupt, but elements with transitional width of thickening bands may in fact be found. The elements with the widest bands occur at the most apical portion of the leaf tip. The function of these peculiar tracheids is difficult to imagine. There is no hydathode formation in the terminal portion of the leaf (which is covered with one to several layers of hypodermal sclereids), nor any stomata in the terminus, so that this function may be ruled out. Although these tracheids are probably rare in angiosperms at large, they have been described in *Cactaceae,* as the account of that family in Metcalfe and Chalk's *Anatomy of the dicotyledons shows* (Cf. also A. Brongniart, Arch. Mus. Hist. Nat. Paris **1**: 405–461. 1839).

Orectanthe.

Leaves of *Orectanthe* are basically not unlike those of the species of *Abolboda* just described, but differ from them in having a broad, flat shape, and an abaxial hypodermis (in some places, at least) as well as an adaxial one. The chlorenchyma cells are elongate in longitudinal section, and have symmetrically placed short arms (fig. 43). They correspond to the cells shown for *Xyris lanata* by Solereder and Meyer (1929, fig. 11b).

1. *O. ptaritepuiana* (fig. 29). In this species, 3–4 cell layers of hypodermis are present on the adaxial surface. The same type of parenchyma cells which comprise the hypodermis are present as a sheath extension on the larger veins, and as a single layer of hypodermis on the abaxial surface between the bundle-sheath extensions (at least in some places). The remaining portions of the mesophyll are pockets, oriented longitudinally in the leaf, which contain a uniform tissue composed of the peculiar chlorenchyma cells described above. The smaller bundles which do not have sheath extensions are embedded in this tissue. The bundles are elongate in transectional outline, and are completely ensheathed by a sclerified bundle sheath. These bundles are strictly collateral in structure.

2. *O. sceptrum.* Both typical *O. sceptrum* and subsp. *occidentalis* (fig. 30) are alike in having leaves thinner than those of *O. ptaritepuiana.* They are like leaves of *O. ptaritepuiana* in all details of anatomy except that (1) they often have an abaxial hypodermis nearly as wide as the adaxial one, (2) they have a prominently sclerified epidermis, and (3) the bundles are round, not elongate, in outline. The thickenings on the walls of the epidermis are narrowest on the outer wall. In upper levels of the leaf of *O. sceptrum* subsp. *occidentalis,* the parenchyma of the hypodermis and bundle-sheath extension was found to be more thick-walled and lignified. A section of the sheath portion of the leaf in this subspecies reveals that the structure of this portion of the leaf is identical with that of the leaves of the larger-stemmed abolbodas.

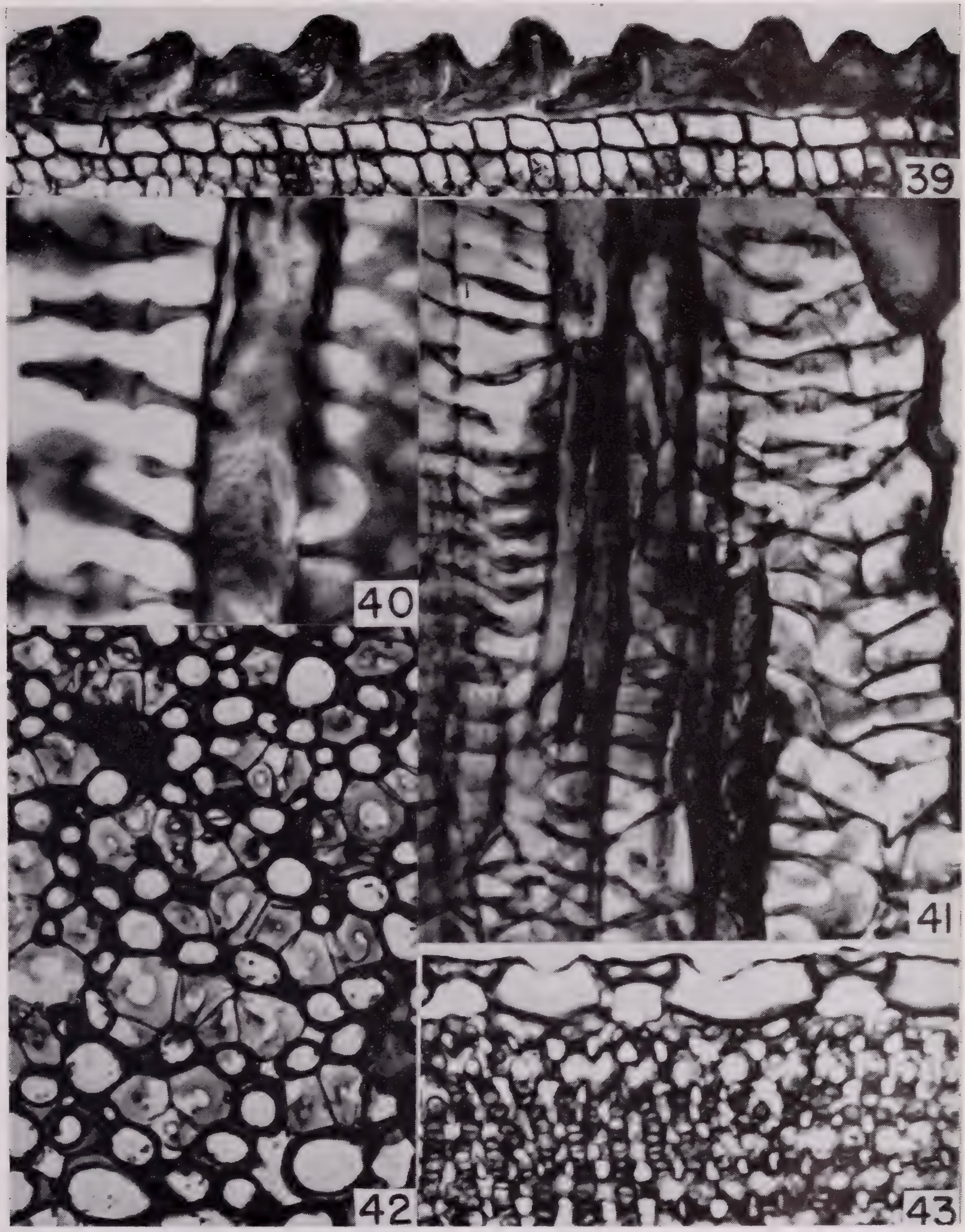
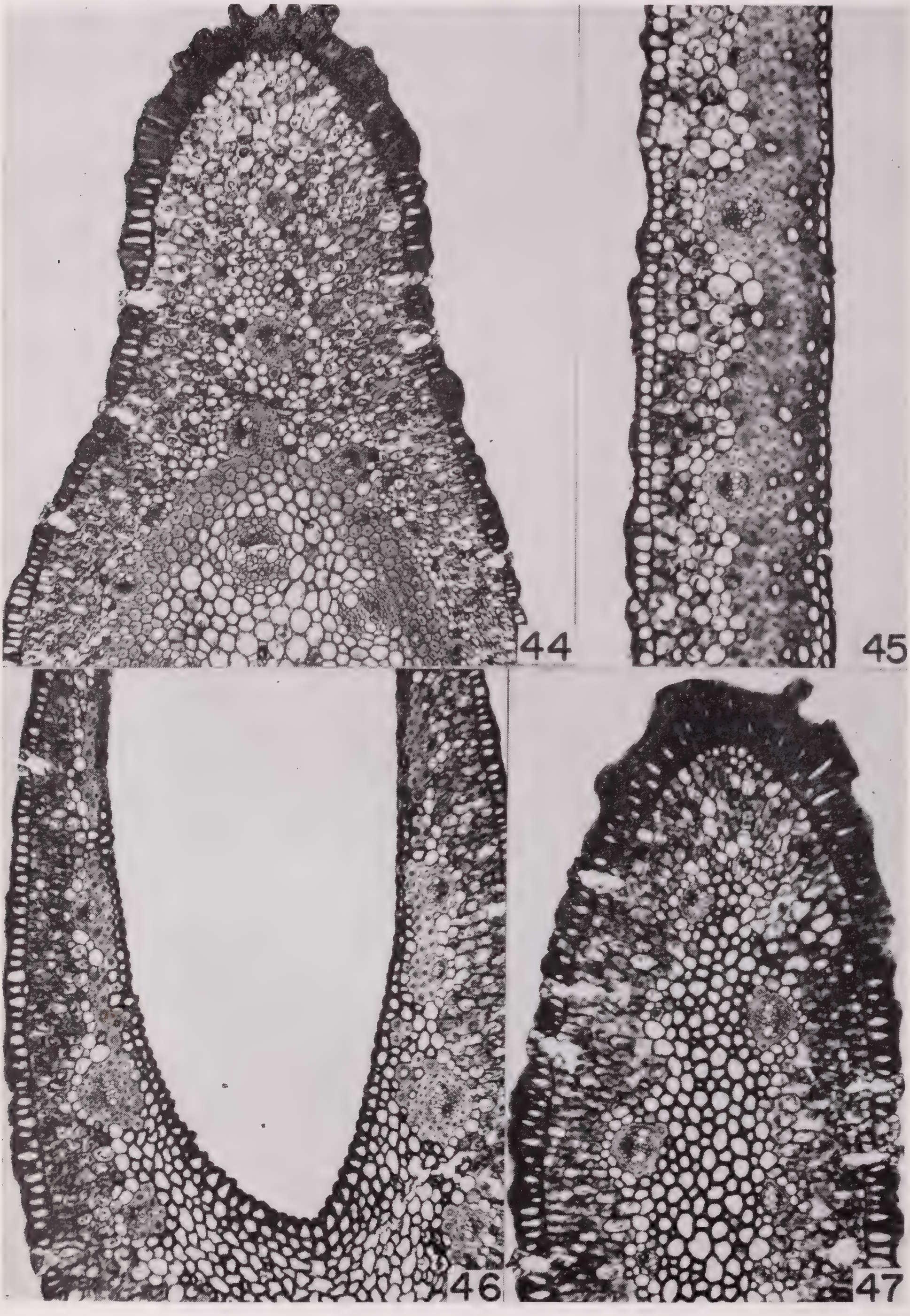


FIG. 39. *Achlyphila disticha,* portion of sagittal section of upper leaf, showing sclereids which comprise the epidermis. × 200. FIG. 40. *Abolboda sprucei,* enlarged portion of a section also shown in figure 41; at left, a tracheid with very wide annular thickenings; in center, a parenchyma cell; at right, out of focus, wide band from a helically-thickened tracheid. × 915. FIG. 41. The same, showing a larger area of a sagittal section of the thorn-like tip of a leaf. Portions of tracheids (with very thin intervening walls) are shown, right, and left, and in the center (dark) parenchyma cells. The tracheids, left, have annular bands; those at right shown annular bands above and helical bands below. × 523. FIG. 42. *A. macrostachya* var. *macrostachya,* transection of thorn-like leaf tip, showing wide-helix and wide-annular band tracheids interspersed among parenchyma cells. × 285. FIG. 43. *Orectanthe ptaritepuiana,* portion of parasagittal leaf section, showing abaxial epidermis (above) and about three layers of arm-palisade cells. × 238.



FIGS. 44–47. *Achlyphila disticha.* FIG. 44. Half of transection of upright stem (inflorescence axis). × 31. FIG. 45. Portion of transection of sheating base, adaxial surface at right. × 100. FIG. 46. Transection of leaf base, at higher level than figure 45, showing

Achlyphila.

Corresponding with the equitant habit of leaves, *Achlyphila disticha* shows anatomical features unusual or unique in *Xyridaceae*. Among these features are the sclerified epidermis, the bands of sclerenchyma in the leaf sheath, and the central zone of thick-walled parenchyma in the upper portions of the leaf. A transection of the sheathing portion of the leaf (fig. 45) shows three distinct zones of mesophyll: the outermost consists of spherical chlorenchyma cells; interior to this is a band of sclerenchyma in which the bundles lie. This sclerenchyma zone represents the widening, and fusion, of the individual sclerenchymatous bundle sheaths, which are separate at higher levels (figs. 46, 47) in the leaf. The innermost layers, present only on the adaxial surface of the central leaf sheath (fig. 46), consist of thick-walled parenchyma cells, isodiametric and polygonal in transection. Because of the equitant habit, sections at higher levels show the fusion of the two halves (fig. 46) into a conformation elliptical in transection (fig. 46). Here the bundles and their sheaths are separate, with no intervening sclerenchyma. The chlorenchyma can be differentiated into palisade and spongy at this level. The cells at the dorsal and ventral edges of the leaf (sclerified epidermis) are prominently elongate as seen in transection, forming irregular shapes. As seen in longitudinal section (fig. 39), the adjacent edges of epidermal calls are often raised into emergences, whereas the central surface of such cells is depressed. This configuration of epidermal cells is reported by Solereder and Meyer (1929) for several *Xyris* species and figured for *X. montivaga*. The elongate sclerified epidermal cells, as seen in transection, closely match those which Arber (1925) figures for *X. anceps*, although this species, unlike *X. montivaga*, does not have the undulate contours of epidermal cells as seen in longitudinal section. Sections of the leaf of *Achlyphila* at the level shown in figure 47 show that the central parenchyma of the leaf is thick-walled, probably lignified, and has an elliptical shape. At higher levels, there is a diminution both in the area of the central parenchyma and the number of bundles which surround it.

Discussion.

Malme's claim in 1925 that leaf anatomy is rather stereotyped in *Abolboda* as compared to *Xyris*, except for the number of veins, does not appear to be justified on the basis of the present study. A number of seemingly excellent specific and species-group characteristics have been described above. Leaf anatomy of *Orectanthe* reveals the similarity of that genus to *Abolboda* as well as the generic distinctions of the two species.

The leaf of *Achlyphila* is not unlike those of other *Xyridaceae* in its general structure. For example, *Xyris asperata* has a similar equitant habit (although the anatomy is quite different), as illustrated by Arber (1925). The presence of a ring of bundles around a zone of thick-walled parenchyma seems unique in the family, however. The epidermal characteristics although quite unlike those of *Abolboda* and *Orectanthe,* find parallels in *Xyris*.

---

portions of the two wings. × 70. FIG. 47. Transection of upper (equitant) portion of leaf, showing slightly more than half; orientation as in figure 46—morphologically adaxial portion of leaf above. × 80.

Vessels.

Although Solereder and Meyer (1929) do not mention the occurrence of vessel elements in leaves of *Xyridaceae*, longitudinal sections of leaves revealed vessel elements with simple perforation plates in the following species: *Abolboda linearifolia, A. macrostachya* var. *angustior, A. macrostachya* var. *macrostachya*, and *A. macrostachya* var. *robustior*. Vessels, therefore, definitely do occur in leaves of at least the larger-leaved species of *Abolboda*. Vessels with simple perforation plates are indicated by Cheadle (1942) for leaves of *Xyris flexuosa* and *X. smalliana*.

INFLORESCENCE AXIS

Solereder and Meyer (1929) have concluded that *Xyris* differs from *Abolboda* in the general structure of the inflorescence axis. *Xyris*, according to these authors, possesses bundles embedded in (rarely outside of) the sclerenchyma ring, whereas *Abolboda* has bundles scattered through the central ground tissue ("pith") as well. This contrast appears to be justified on the basis of the present study. Solereder and Meyer also claim that bundles of the graminean type are absent in the inflorescence axes of *Abolboda* although they are present in *Xyris*. I have found that the more basal portions of inflorescence stems in *Abolboda* tend to have "ordinary" collateral bundles, or ones which are somewhat amphivasal. At higher levels, the graminean-type bundles were seen in "pith" of all the taxa considered here except *Abolboda acicularis, A. americana,* and *Achlyphila disticha*.

Abolboda.

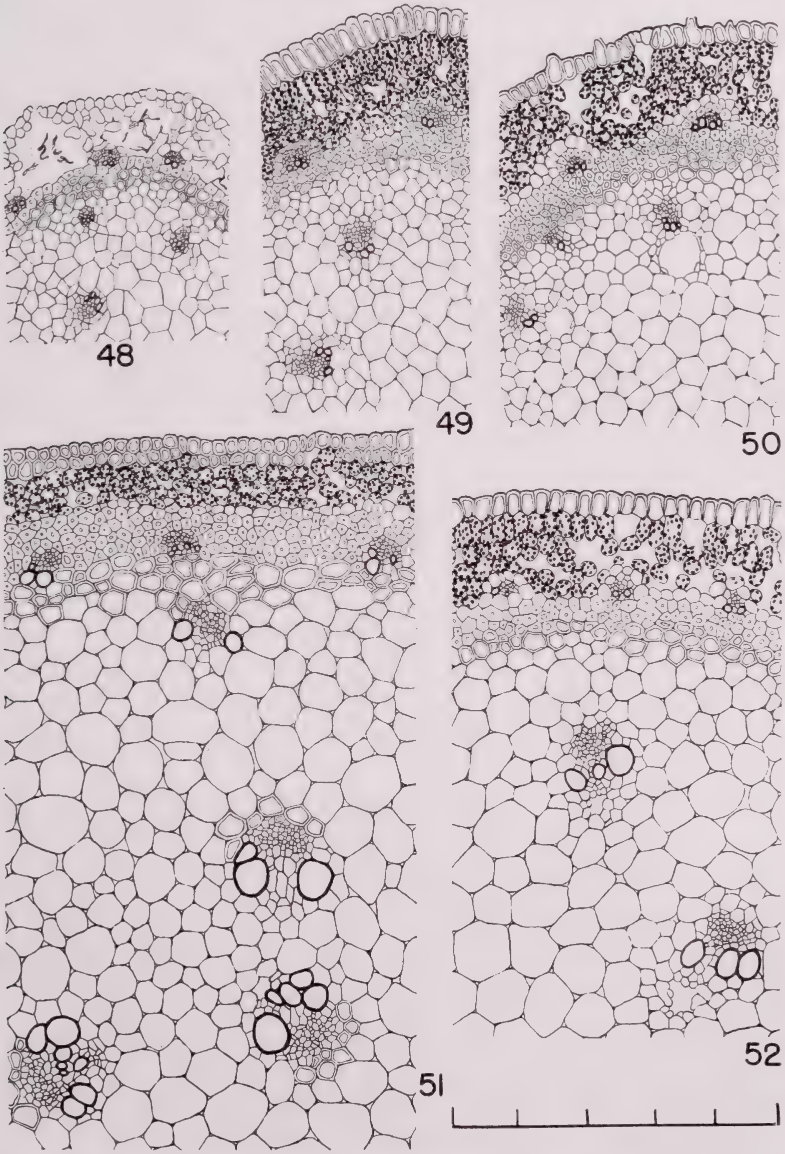
Variables within a single inflorescence axis of *Abolboda* include the relative presence of photosynthetic tissue and the thickness of the sclerenchyma ring. Chlorenchyma appears to be absent from those portions of the axis most distal and most proximal to the base of the plant. Chlorenchyma, where present, consists of nearly spherical cells; some may be somewhat elongate radially, and form a palisade. If chlorenchyma is not present, parenchyma cells polygonal in outline in transection (elongate in longitudinal section) extend from the epidermis to the sclerenchyma ring. If chlorenchyma is present, a single layer of non-photosynthetic parenchyma is often present outside the sclerenchyma ring. If chlorenchyma is present, a single layer of non-photosynthetic parenchyma is often present outside the sclerenchyma ring, particularly at those points where bundles are adjacent to the outer face of that ring. The sclerenchyma ring consists of several layers of thick-walled lignified cells. The outermost may have much thicker walls than layers internal to it.

1. *A. acaulis*. Because of the nearly sessile habit of the inflorescence in this species, no structure comparable to the inflorescence axis in the other species can be studied.

2. *A. acicularis*. This species (fig. 49) shows a number of features typical for the genus. Within the epidermis, both palisade and spongy palisade chlorenchyma occur. The single layer of non-photosynthetic parenchyma outside the sclerenchyma ring is ordinarily present. The outer face of each of the bundles (about 7) which occur outside the ring is sheathed by a single layer of sclerenchyma. No bundles occur within the sclerenchyma ring itself,

which is about three layers thick. A number of scattered bundles are present in the "pith" region.

3. *A. americana* (fig. 48). The cortical region of the inflorescence stem is notable for the occurrence of pockets (which run longitudinally in the exis) of collapsed parenchyma cells—like those which occur in a similar manner in the leaves of this species. The collapsed parenchyma pockets occur alternately with bundles of the outer circle. The remainder of the cortical region consists of globular parenchyma cells. The bundles adjacent to the outer margin of



FIGS. 48–52. Portions of transections of inflorescence axes of *Abolboda.* exterior above. FIG. 48. *A. americana.* FIG. 49. *A. acicularis* var. *acicularis.* FIG. 50. *A. ciliata* FIG. 51. *A. linearifolia.* FIG. 52. *A. sprucei.* Scale = 0.5 mm in 0.1 mm subdivisions.

the sclerenchyma ring are not completely ensheathed by sclerenchyma, but have a few such cells at their phloem poles. A single layer of thick-walled sclereids forms the outer layer of the ring. Internal to this layer are several layers of lignified parenchyma cells. Just interior to these cells, in the periphery of the central zone of the central zone of thin-walled parenchyma, is a single ring of about 5 bundles.

4. *A. ciliata* (fig. 50). At the level shown, the inflorescence axis is surrounded by a bract. This may account for the occurrence of lignified papillate epidermal cells. The cortical zone consists of spherical chlorenchyma cells. A number of bundles, each surrounded by an arc of sclereids, is present outside the sclerenchyma ring. The inner portion of the ring intergrades with the thin-walled parenchyma in the "pith" region. Within this latter zone, several (about 6) bundles occur. These bundles are notable for the occurrence of a prominent protoxylem lacuna which is separated from the remainder of each bundle. An additional set of bundles is interposed between those just mentioned and the inner margin of the sclerenchyma ring at lower levels in the inflorescence axis, and presumably these bundles supply a bract, and are thus absent at the level shown.

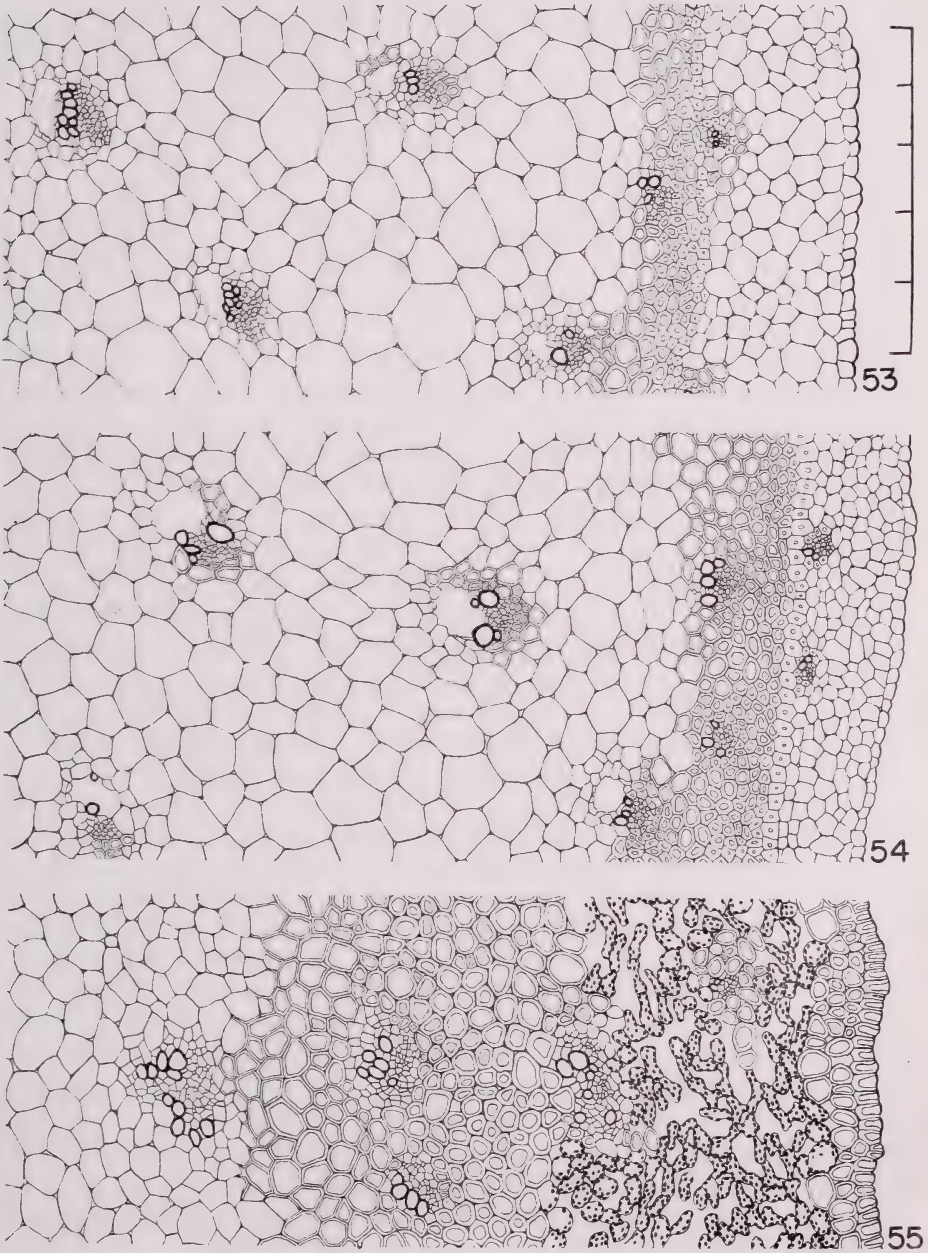
5. *A. linearifolia* (fig. 51). Although inflorescence stems in this species are larger in diameter than the above, they are not markedly different in most respects. One notable feature is the occurrence of a single hypodermis layer. At levels lower than that shown, two layers were apparent. A feature not previously indicated is the presence of bundles (in addition to those at the outer margins of the sclerenchyma ring) within the ring itself. Additional bundles are present in the "pith" region. At lower levels, all bundles (except those at the outer margin of the ring) are located in the thin-walled portion of the central ground tissue.

6. *A. macrostachya* var. *angustior*. Upper levels in the inflorescence axis of this variety show a structure like that mentioned for such levels in *A. linearifolia*, except that the cortical region consists wholly of parenchyma cells like those of the hypodermis. At lower levels, however, 2–3 hypodermis layers are present; interior to these is chlorenchyma. Outside of the sclerenchyma ring, numerous bundles occur; these are embedded in the non-photosynthetic parenchyma. A single layer of strongly thickened sclereids forms the outermost layer of the sclerenchyma ring, and several layers of lignified parenchyma occur within that layer, as described for *A. americana*. Numerous bundles are present in the central thin-walled ground tissue. The tendency toward amphivasal construction of bundles is prominent at lower levels.

7. *A. macrostachya* var. *macrostachya* (fig. 53). In the section shown, the cortical tissue consists of non-photosynthetic parenchyma. At higher levels, chlorenchyma is present interior to one or two layers of hypodermis. In addition to the bundles at the outer margin of the sclerenchyma ring, there are a few embedded in its inner margin (fig. 53). Many bundles occur in the thin-walled central ground tissue. Each of these bundles possesses a few lignified elements near the phloem pole. Such elements are absent at lower levels.

8. *A. macrostachya* var. *robustior* (fig. 54). This inflorescence axis is quite similar to that of the above variety, but several features are worthy of note. The bundles at the exterior of the sclerenchyma ring are much smaller than

those in the interior of the stem. The outermost layer of sclerenchyma is much more thick-walled than interior layers, which grade into the thin-walled condition of the central ground tissue. Exceptionally large protoxylem lacunae, and intergradation to a graminean type of bundle construction may be seen.



FIGS. 53–55. Transections of inflorescence axes, exterior at right. FIG. 53. *Abolboda macrostachya* var. *macrostachya*. FIG. 54. *A. macrostachya* var. *robustior*. FIG. 55. *Orectanthe sceptrum*. Scale = 0.5 mm in 0.1 mm subdivisions.

9. *A. sprucei* (fig. 52). The inflorescence stem of this species shows no features not indicated above, but illustrates the generic characters rather clearly. The cortical zone of this axis is composed of spherical chlorenchyma cells. Exterior to the sclerenchyma ring is a circle of bundles; this circle is enveloped by a layer of non-photosynthetic parenchyma. The outermost layer of the scelerenchyma ring is very thick walled, and several less prominently sclerified cell layers occur internal to it. All the central bundles occur in the thin-walled ground tissue, although some are adjacent to the sclerenchyma ring. Bundles are of the graminean type or transitional to that type from the ordinary collateral.

Orectanthe.

An inflorescence axis of only one species, *O. sceptrum* (fig. 55), was sectioned. This stem showed a number of noteworthy features. A sclerified epidermis is present. Beneath this are about two cell-layers differentiated as a hypodermis. The remainder of the cortical zone consists of spongy chlorenchyma. Within the chlorenchyma are a number of bundles, most of which have a sclerenchymatous sheath. The sclerenchyma ring contains a number of bundles, not disposed in concentric circles. The thin-walled ground tissue intergrades into the sclerenchyma ring. Bundles of the sclerenchyma ring and central ground tissue are intermediate between amphivasal and collateral patterns.

Achlyphila.

The markedly flattened inflorescence axis of this genus (fig. 44) suggested that more or less prominent differences from *Abolboda* would be present. In fact, despite the obvious differences in shape, the similarities are perceptible. To be sure, the epidermis (which is two-layered in places at the edges of the axis) is heavily sclerified. Then, too, bundles (each with a fibrous sheath) occur in the cortical region on each edge of the axis. Aside from these differences, one can cite similarities in the chlorenchyma: two layers of palisade and several spongy layers are present. Adjacent to the outer margin of the sclerenchyma ring—or "ellipse"—bundles are present, each sheathed by a single layer of fibers along the outer surface, as in *Abolboda*. Bundles are present in the sclerenchyma, toward the inner margins of its extent. The central ground tissue consists of thin-walled parenchyma and (unlike *Abolboda*, but like *Xyris*) contains no bundles. The last-cited feature suggests that the resemblances of *Achlyphila* may lie closer to *Xyris* than to *Abolboda*.

Because *Achlyphila* is unique among *Xyridaceae* in not having a congested inflorescence, elongate pedicels are present. As is shown in figure 82, the pedicel is triangular in outline. Like the inflorescence axis, the pedicel has a sclerified epidermis. Two circles of bundles, one adjacent to the inner margin of the sclerenchyma ring (or, at lower levels, just within the ring) may be found. A central zone of thin-walled parenchyma is present.

Discussion.

The above descriptions must not be construed as exhibiting the full range of variation either in a species or in an individual axis, although an attempt is made to suggest the nature of such variation. Because of this variability, species characters are difficult to offer. The inflorescence stems of *Abolboda macrostachya* are distinctive on account of their greater size (with more numerous bundles). Special features in the axes of *A. americana* (a single circle of "pith" bundles; collapsed parenchyma pockets) and *A. ciliata* (1–2 circles of "pith" bundles; prominent protoxylem lacunae in these) may be noted. The extent of sclerenchyma seems roughly correlated, in *Abolboda*, with size of the axis, and the sclerenchyma ring in *A. macrostachya* is much wider than in *A. americana*. Likewise, the very wide sclerenchyma cylinder in *Orectanthe* may be correlated with the large diameter of that axis. The sclerified epidermis, the lack of concentric arrangement of bundles, the presence of scattered bundles in the cortical region, and the presence on these of fibrous sheaths are all characters which differ to a certain extent from comparable conditions in *Abolboda*, and enforce the generic status of *Orectanthe*. The descriptions of *Achlyphila* above have shown that inflorescence-axis anatomy serves both to distinguish this genus generically, and to relate the genus to other *Xyridaceae*, probably to *Xyris* most closely.

Vessels.

Solereder and Meyer (1929) cite a report of vessels with simple perforation plates in inflorescence axes of *Xyris caroliniana*, *X. indica*, and *X. lacera*. In the present study, such vessel elements were observed in longitudinal sections of inflorescence axes of the following taxa: *Abolboda acicularis*, *A. americana*, *A. macrostachya* var. *macrostachya*, *A. macrostachya* var. *robustior*, and *Orectanthe sceptrum*. Cheadle (1942) indicates vessels with simple perforation plates in *Xyris flexuosa* and *X. smalliana*.

INFLORESCENCE BRACTS

One or more bracts tend to occur along the inflorescence axis, and several are associated with the congested inflorescence itself. The former are here termed inflorescence-axis bracts and the latter inflorescence bracts. These bracts show patterns of structure different from those of sepals or leaves, and are worthy of description. In some instances (*Abolboda acicularis*, *A. ciliata*) the difference between structure of inflorescence-axis bracts and sepals is not very great. Because inflorescence-axis bracts and inflorescence bracts vary in structure from base to apex, and even within a plant, depending on their position, their structure is difficult to categorize accurately in all instances. Sections studied are discussed by species.

Abolboda.

1. *A. acaulis*. Because of the subsessile nature of the inflorescence in this species, bracts might best be regarded as inflorescence bracts. Such bracts have three veins in a non-photosynthetic parenchyma. Sclerenchyma is absent.

2. *A. americana* (fig. 24). An inflorescence bract is illustrated for this species. Three veins are present. The middle one of these is embedded in a sclerenchyma band which extends between the two surfaces.

3. *A. ciliata* (fig. 17). The illustration represents the basal portion of an inflorescence-axis bract. Numerous veins are present. These are encased in sclerenchyma sheaths, some of which are continuous with the sclerified adaxial surface. Chlorenchyma is present on the abaxial surface.

4. *A. linearifolia.* An inflorescence bract is illustrated in figure 23. The abaxial epidermis is sclerified; the mesophyll is divisible into three zones, from outside to inside: chlorenchyma, non-photosynthetic parenchyma, and sclerenchyma.

5. *A. macrostachya* var. *angustior.* The outer portion of an inflorescence-axis bract consists of spongy chlorenchyma. The adaxial portion of the mesophyll, in which veins are located, consists of non-photosynthetic parenchyma. A few fibers are present on the phloem poles of larger bundles.

5. *A. macrostachya* var. *macrostachya.* The two sections shown (figs. 18, 19) illustrate a great deal of difference between the median region and the most apical portion of an inflorescence-axis bract. At the lower level (fig. 19), the mesophyll contains sclerenchyma on the adaxial face, and a few bands of such tissue on the abaxial face. Chlorenchyma and non-photosynthetic parenchyma form bands within the bract. At the highest level (fig. 18), the entire mesophyll consists of thin-walled sclerenchyma.

6. *A. macrostachya* var. *robustior* (figs. 20, 22). The inflorescence-axis bract is distinctive in that the ground tissue consists of sclerenchyma, more nearly thin-walled halfway between the surfaces of the bract, which contains pockets of parenchyma, possibly chlorenchyma. In addition to the main series of veins, a few smaller veins are adjacent and exterior to the parenchyma pockets. They have the same collateral orientation as the main veins. The inflorescence bract (fig. 22) is not dissimilar in structure, although it has more thick-walled sclerenchyma, definite chlorenchyma, and bundles adaxial to the chlorenchyma.

Orectanthe.

An inflorescence-axis bract of *Orectanthe sceptrum* subsp. *occidentalis* shows a notable lack of mesophyll differentiation. The entire mesophyll consists of thin-walled parenchyma. Small fibrous bundle caps are present on the phloem poles of the veins. Inflorescence-axis bracts of *O. ptaritepuiana* showed an identical structure.

Achlyphila.

The bracts in this plant (fig. 66) are thin, papery inflorescence bracts, not entirely comparable with any of the above because of the distinctive inflorescences of this plant. The three bundles are each ensheathed with a fibrous bundle sheath.

Discussion.

Obvious distinctive modes of bract structure occur in the taxa mentioned above. The lack of mesophyll differentiation in *Orectanthe* and *Achlyphila* bracts is intersting, for considerable differentiation occurs in comparable bracts of *Abolboda*. In *Abolboda*, particular types of bract structure (depending at least in part on the location of the bract on the plant and the level of section within a bract) suggests caution in the formulation of differences among the species of *Abolboda* in bract anatomy.

SEPALS

With the exception of *Achlyphila*, all the taxa studied here have keeled sepals. Some *Xyridaceae*, such as *Orectanthe*, have both keeled and non-keeled sepals. The non-keeled sepals were found to have approximately the same structure as the winged portion of a keeled sepal (compare, for example, figures 21 and 64), so that separate descriptions are not necessary. The chief variation of significance is the relative distribution and presence of sclerenchyma and (if present) chlorenchyma. To a large extent, the distribution of these tissues in comparison with non-photosynthetic parenchyma cells provides distinctions of taxonomic importance. The patterns are best summarized in terms of species.

Abolboda.

1. *A. acaulis* (fig. 56). The majority of the sepal is composed of lignified parenchyma, in which the three bundles are embedded. Chlorenchyma occurs in the keel of the sepal.

2. *A. acicularis* (fig. 57). The adaxial face of the sepal is composed of thick-walled sclerenchyma; the pattern of distribution parallels the outline of the bract; the portion adaxial to the keel contains the single vascular bundle. The outer face of the bract contains spherical chlorenchyma cells; a small zone of non-photosynthetic parenchyma is present in the keel.

3. *A. americana* (fig. 58). The structure of this sepal is virtually the same as that shown for *A. acaulis.*

4. *A. ciliata* (fig. 59). The sepal of this species contains sclerenchyma, which is present on the adaxial face and extends toward the keel, where it encloses the midvein. An additional strand of sclerenchyma is present in the most abaxial portion of the keel. Chlorenchyma occurs on the abaxial face of the bract.

5. *A. linearifolia* (fig. 60). This sepal is distinctive in the limited amount of sclerenchyma present on the adaxial face. The remainder of the bract consists of parenchyma cells which are polygonal as seen in transection. The central portion of this parenchyma contains numerous chloroplasts. Five veins are present in the mesophyll.

6. *A. macrostachya* var. *angustior* (fig. 61). This sepal has sclerenchyma distribution similar to that of *A. linearifolia*, but the adaxial band is wider and is connected with at least a partial abaxial band in the wings (at levels higher than that shown). Sclerenchyma is very thick-walled. Five bundles are present in the non-photosynthetic parenchyma which composes the remainder of the sepal.

7. *A. macrostachya* var. *macrostachya*. The sepal in this variety in intermediate between those of var. *angustior* and var. *robustior* in that the abaxial sclerenchyma band is better developed than in var. *angustior*. Some of the lateral bundles are embedded in the sclerenchyma of the wings.

8. *A. macrostachya* var. *robustior* (fig. 62). The sclerenchyma on the adaxial surface is paralleled (and in places, fused with) a band which parallels the abaxial surface along the wings. The abaxial sclerenchyma extends farther into the keel than in the other varieties. The five bundles are present in the non-photosynthetic parenchyma which comprises the remainder of the sepal.

9. *A. sprucei* (fig. 63). This sepal shows two distinct zones of sclerenchyma: an adaxial one which parallels the inner face of the sepal, and an abaxial zone in the keel. Appproximately nine bundles are present. A narrow band of chlorenchyma is present on the abaxial face of the bract.

Orectanthe.

1. *O. ptaritepuiana.* The sepal of this species consists wholly of lignified parenchyma, except in the central portion of the keel, where thin-walled parenchyma occurs. This thin-walled parenchyma presumably contains a moderate number of chloroplasts, as it does in *O. sceptrum.*

2. *O. sceptrum.* As shown in figure 64, sepals of *O. sceptrum* subsp. *occidentalis* are like those of *O. ptaritepuiana* except that pockets of thin-walled parenchyma, like that in the keel region, occur in the wing regions between veins. Liquid-preserved material was used to demonstrate the presence of chloroplasts in this soft-walled parenchyma. The central portion of a flattened sepal of this species, shown in figure 21, illustrates these same structural features.

Achlyphila.

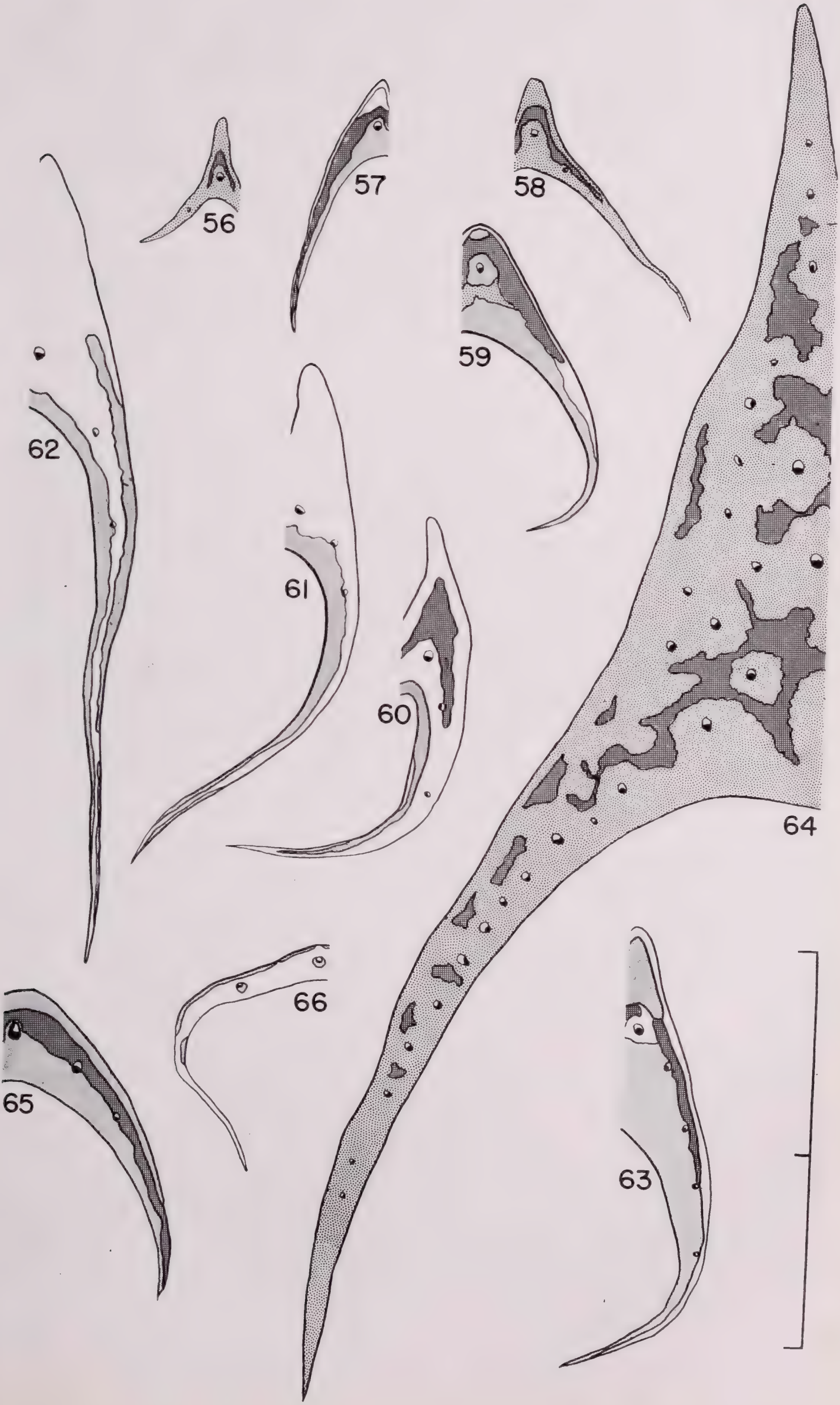
The three sepals of *Achlyphila disticha* (fig. 65) are rounded rather than keeled. They contain about five bundles, which are embedded in the thin-walled parenchyma, composed of cells polygonal in outline, in the central portion of the sepal. This parenchyma contains chloroplasts in moderate numbers. The inner and outer faces of the sepal are sclerenchyma. At lower levels, this sclerenchyma takes the form of lignified parenchyma which intergrades with the thin-walled parenchyma in the center of the bract, but at higher levels, such as that shown, the sclerenchyma is thick-walled and clearly definable from the chlorenchyma.

Discussion.

The sepals of *Orectanthe* are different from those of *Abolboda* in that (1) they are much larger; (2) they consist wholly of lignified parenchyma cells except for pockets of chlorenchyma in the keel and between some of the veins; and (3) they contain a much greater number of veins, and veins have a scattered distribution in the keel region. Sclerenchyma is present around veins in *Orectanthe* sepals regardless of location of veins. Sepals of *Achlyphila* are very simple in structure, corresponding with other seemingly unspecialized features of this genus. The presence of both an adaxial and an abaxial band of sclerenchyma, together with the lack of a keel, is notable. The species of *Abolboda* seem to agree in their tendency toward production of an adaxial sclerenchyma band, and in the relative paucity of sclerenchyma in the abaxial portion of the sepal. Only a single series of bundles is present (unlike the condition in *Orectanthe*). The patterns of distribution of sclerenchyma, thin-walled parenchyma, and chlorenchyma undoubtedly lend themselves to use as specific criteria, and are self-evident, in the varied patterns illustrated, in

---

FIG. 56–65, sepals, transections taken about midway along length of sepal; half of a keeled sepal is shown for each species. FIG. 56. *Abolboda acaulis.* FIG. 57. *A. acicularis* var. *acicularis.* FIG. 58. *A. americana.* FIG. 59. *A. ciliata.* FIG. 60. *A. linearifolia.* FIG. 61. *A. macrostachya* var. *angustior.* FIG. 62. *A. macrostochya* var. *robustior.* FIG. 63. *A. sprucei.* FIG. 64. *Orectanthe sceptrum.* FIG. 65. *Achlyphila disticha.* FIG. 66. *Achlyphila disticha,* transection of bract of inflorescence proper. Patterns as follows: fine stippling = thick-walled sclerenchyma; coarser stippling = thin-walled sclerenchyma; cross-hatched = chlorenchyma; white in bundles = phloem; black = xylem; parenchymatous ground tissue left blank. Scale = 2 mm in 1 mm divisions; applies to all figures.



sepals of *Abolboda*. Because of variation in such patterns between the base and apex of a sepal, however, such patterns should be applied with caution. Unfortunately, no liquid-preserved sepals of *Xyris* were available for study. The writer suspects that these would show much resemblance to sepals of *Abolboda*, and would be worth investigating in any case.

FLORAL VENATION

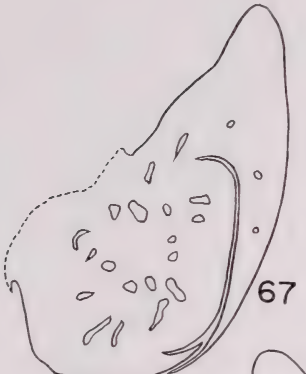
The flowers of *Abolboda* and *Orectanthe* are alike in a number of features. The flowers of *Orectanthe* differ in having non-keeled sepals, in lacking staminodia, and in having larger parts which are more richly vascularized at least in some instances (corolla lobes, sepals) than the corresponding portions of *Abolboda* flowers. The general venation pattern in the two genera is sufficiently similar so that variations are considered below after a description of a typical venation pattern in *Abolboda*.

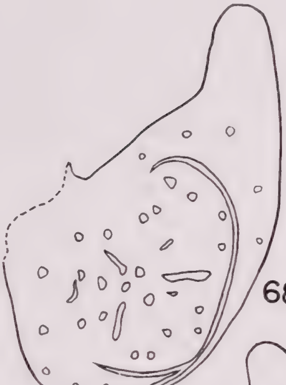
Abolboda.

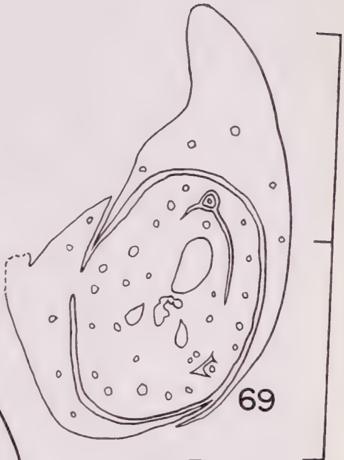
The flower of *A. linearifolia* (figs. 67–81) proved convenient material for a study of venation, and does not appear to differ appreciably from other species in these respects. The levels shown offer a series of selected sections from the base of the flower to the top. Because of venation complexities, a series of sections appeared preferable. The broken line in figures 67–69 is merely used to indicate incomplete separation of a sepal from tissue of the inflorescence receptacle at those levels.

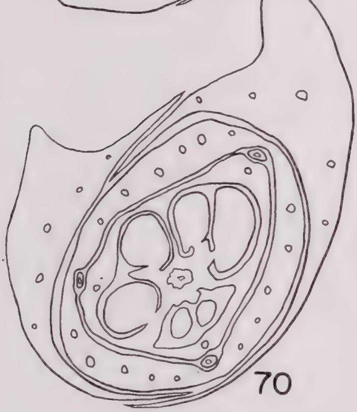
At the lower level indicated (fig. 67) a vascular cylinder can be seen. The bundles of the cylinder have branched, at a level lower than that shown, to supply the approximately five traces present in each sepal. At the next level (fig. 68) sepal traces are in their characteristic positions, and divergence of median corolla bundles is indicated. Only ovary bundles are present on the central area a short distance above this level. Five traces depart to each third of the corolla tube; these thirds correspond to the three corolla lobes at a higher level. This is more evident in figure 69, which shows two of the three staminodia that will be alternate with these thirds of the corolla tube. There is a clearly definable midvein in each third of the corolla tube (see particularly figure 72). At the level shown in figure 69, as well as in figure 70, the nature of ovary venation is evident. There are three dorsal carpellary traces and three ventral ones, although the latter are fused together at these levels. At the next higher level (fig. 71) separation of the axial portion of the ovary into three placentas, each with a vein (or in some preparations, a pair of veins) is shown.

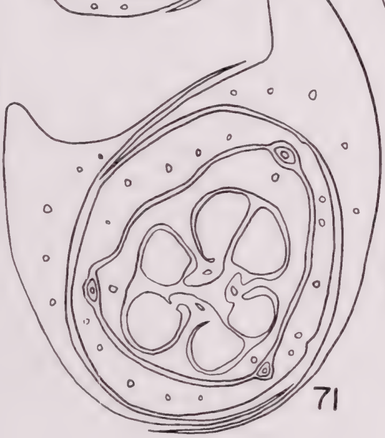
FIGS. 67–81. *Abolboda linearifolia,* successive transections of a flower. Sepals are omitted in figures 72–75, and style only is shown in figures 76–81. FIG. 67. Departure of traces to sepals. FIG. 68. Departure of traces to corolla. FIG. 69. Base of ovary. FIG. 70. Level at which placentas are united; note three staminodes, each opposite a locule of ovary. FIG. 71. Level at which placentas are separate. FIG. 72. Upper end of ovary locules. FIG. 73. Level of ovary crests; note the triangular style base in center, the three staminodes just inside the corolla, and the two style appendages. FIG. 74. Departure of stamen traces; base of anthers; note several traces in each style appendage. FIG. 75. Level of stamen connectives; note cylindrical conformation of bundles in style of appendages. FIG. 76. Departure of style appendages from style. FIGS. 77–80. Branching of bundles in upper portions of style. FIG. 81. Stigma. Vascular bundles in all figures represented by circles (or modified shapes). Scale = 2 mm in 1 mm divisions.

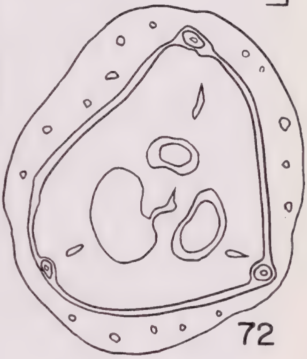

67

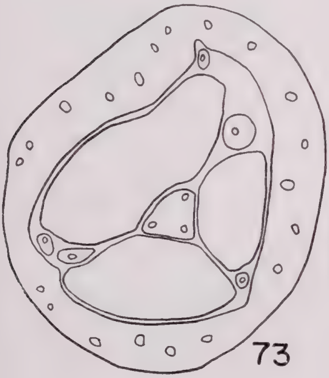

68

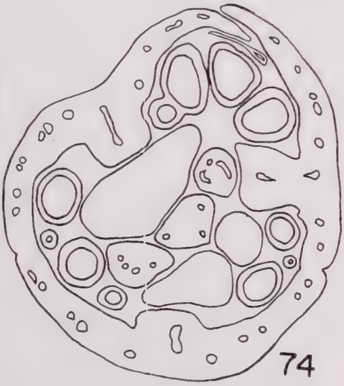

69

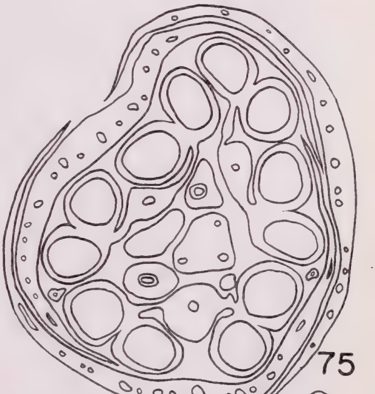

70

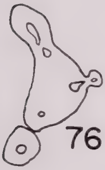

71

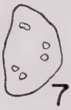

72

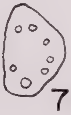

73

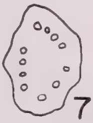

74

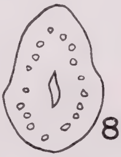

75


76


77


78


79


80

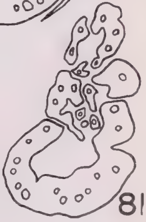

81

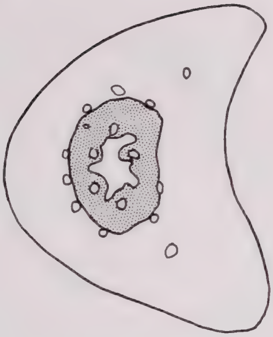
Figure 72 shows the termination of the ventral carpellary traces (below the level shown). The dorsal traces turn inward as the ovary narrows into the style, and only the three dorsal traces are present in the style base (fig. 73). In figure 73, the ovary appears fragmented into three portions (other than the style and style-appendages), and the larger triangular shapes represent the ovary crests. At the next level (fig. 74) departure of stamen traces, by branching from the median corolla traces, can be seen. The uppermost of the staminodia shown terminates at this level. In figure 75, the three corolla lobes become free from each other. Concomitantly with their greater widening into an imbricate conformation, there is considerable ramification of veins. The upper tips of two of the ovary crests may be seen at this level. The following figures show the changes in vascularization of the style. In figure 76, departure of ovary appendages may be seen. These appendages are recurved, so that description of changes in their anatomy from departure to tip proceeds in the reverse order, in terms of figure numbers. The bundles that depart into the ovary appendages are branches of the three style traces, not the traces themselves. One of the appendages is very short; the other two (fig. 75) show an alteration in vascularization. A cylindrical organization of the bundles is attained. At a lower level (fig. 74), these cylinders subdivide into several bundles, and at the tip of the appendages (fig. 73) only a single bundle is present. This bundle, in each, does not extend all the way to the appendage apex. Returning to the style proper (fig. 77), one may see that the three veins branch. This branching continues (figs. 78–81) so that numerous vein-endings enter the ultimate fringes of the stigma. Development of a central cavity in the style is illustrated in figure 80.

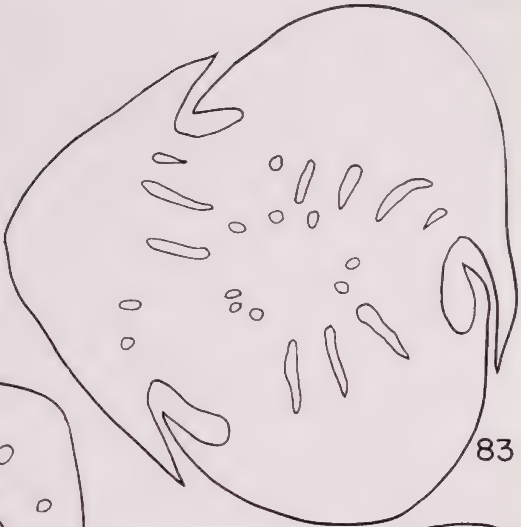
Variation in venation among the species of *Abolboda* seems to occur only in the number of bundles per sepal (see above) and the relatively abundant or few veins in the corolla, depending largely on corolla size.

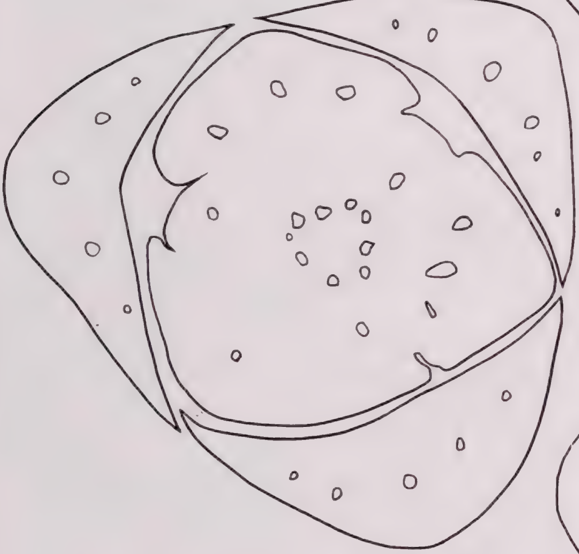
The question naturally arises, what interpretation of the ovary appendages seems most appropriate in terms of their venation, position, and histology. They cannot be regarded as equivalent to two of the three stigmas (if two are present), on account of their venation. They represent, rather, branches of the style bundles. The vein in each appendage does not terminate as a hydathode, nor do the contents of cells in the appendage suggest a nectary function, although this possibility should not be ruled out. The function of these structures —if they do have any prominent function—may well be related to a pollination mechanism in some way, but without further knowledge, speculations concerning function would be pointless. A feature of some interest is the nature of bundles in the very large ovary appendages of *Orectanthe*. In *O. sceptrum*, the bundle was observed to be large and rather diffuse, with isolated patches of xylem and phloem cells.

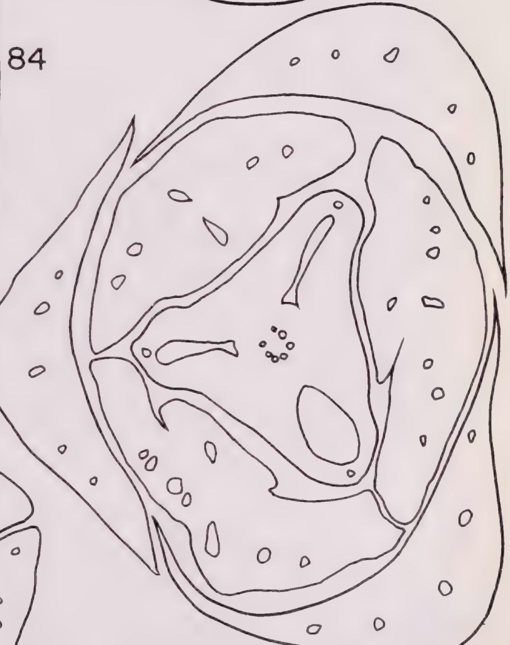
In respects other than numbers of veins and absence of staminodia, the resemblance between *Abolboda* and *Orectanthe* flowers are close, and ovary and style of *Orectanthe* flowers have a venation identical to that in *Abolboda*.

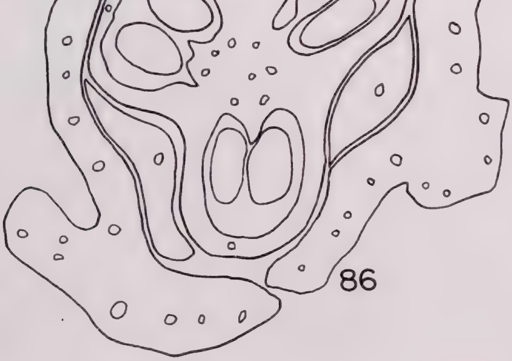
FIGS. 82–87. *Achlyphila disticha*, successive transections from flower. Sepals omitted in figure 86, and only style base shown in figure 87. FIG. 82. Pedicel. Stippling represents thick-walled sclerenchyma. FIG. 83. Departure of sepal traces. FIG. 84. Base of petals. FIG. 85. Departure of stamen traces. FIG. 86. Ovary at level of ovules. FIG. 87. Style base. Vascular bundles in all figures represented by circles (or modified shapes). Scale = 2 mm in 1 mm divisions.

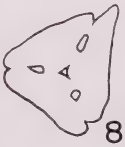

82


83


84


85


86


87

Achlyphila.

The venation of the flower of *Achlyphila* is relatively simple in comparison with that of *Abolboda*. Fewer levels therefore suffice to show the principal features, and are shown in figures 82–87. The pedicel, illustrated in figure 82, contains two circles of bundles. The outermost of these circles departs into the bases of the three sepals (fig. 83), in such a way that five traces are present in each sepal (fig. 84). Successive levels (figs. 84, 85) illustrate that above the level of sepal departure, the three whorls—petals, stamens, and gynoecium—become separate at approximately the same point. As in *Abolboda*, the stamen traces branch from the vein which can be demarcated as the midvein of each petal. No traces indicate any vestige of three other stamens, or of staminodia, which might be assumed to have been present primitively. About five traces are present in each petal, although these probably originate from about three traces in each petal base. The venation of the ovary is identical to that of *Abolboda*, as a higher level (fig. 86) indicates. As in *Abolboda*, widening of the petals is concomitant with branching of veins. Ridges, which fit into interstices between the sepals, were observed on the abaxial surface of the petals, and presence of these ridges alters the appearance of petal vascularization somewhat, for these ridges are vascularized. The venation of the style is as in *Abolboda*, except that no branching of the three veins takes place, as no appendages are present.

The similarities between *Abolboda* (e.g., *A. linearifolia*) and *Achlyphila* in respect to floral venation are quite striking. The only major differences are in the relative levels at which veins depart. Staminodia and ovary appendages are absent in *Achlyphila*, and three, rather than two, sepals are present (although some species of *Abolboda* also have three sepals).

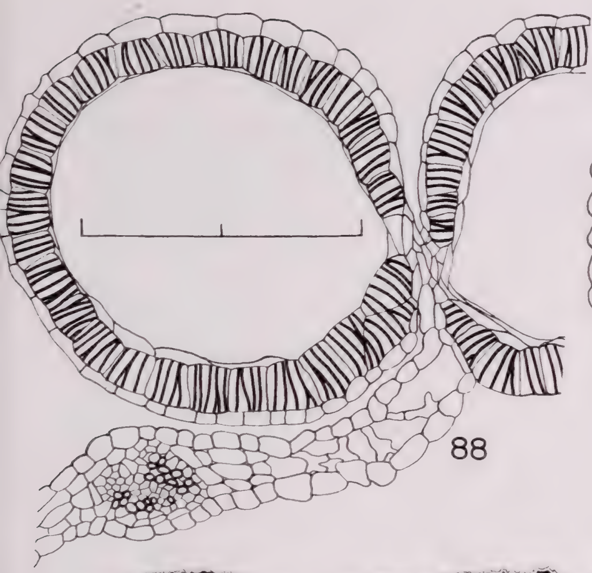
FLORAL HISTOLOGY

Certain details of floral anatomy other than venation are worthy of description here because of their importance in suggesting specific and generic relationships. Some of these have been mentioned in connection wth sepal structure.

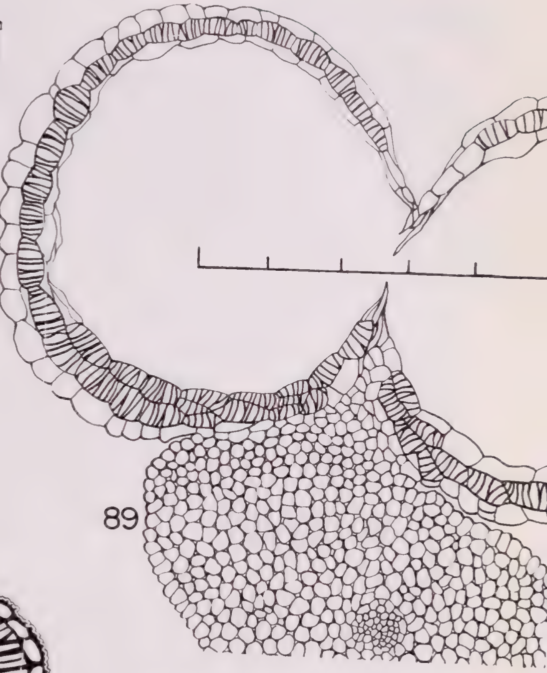
Corolla Lobe.

Corolla lobes, as might be expected, are thicker in their central portion than at their margins. The maximum width of corolla lobes was found to offer a convenient point of comparison. The corolla lobe of *Abolboda linearifolia* (fig. 92), like those of the other species of *Abolboda*, has a maximum width of approximately four mesophyll cells. The maximum mesophyll width in corolla lobes of *Orectanthe sceptrum* subsp. *occidentalis* (fig. 91) proved to be about 10 cell layers; these cells are much larger than those of *Abolboda*. In *Achlyphila disticha*, the maximum width (excluding ridges) appeared to be about 8 layers, as shown in figure 93, with a lignified sheath around veins.

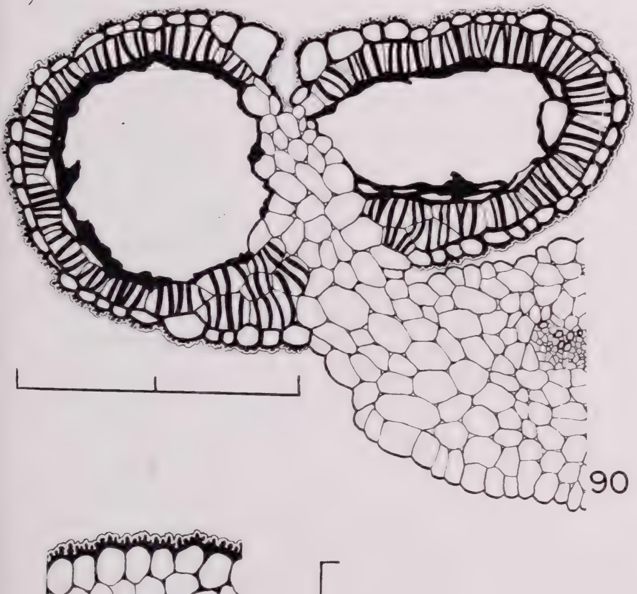
FIGS. 88–90. Portions of transections of anthers. FIG. 88. *Abolboda linearifolia*. FIG. 89. *Orectanthe sceptrum*. FIG. 90. *Achlyphila disticha*. FIGS. 91–93. Portions of transections of corolla lobes or petals. FIG. 91. *Orectanthe sceptrum*. FIG. 92. *Abolboda linearifolia*. FIG. 93. *Achlyphila disticha*. Scale for figures 91–93 is shown beside figure 92. All scales are in 1 mm divisions.



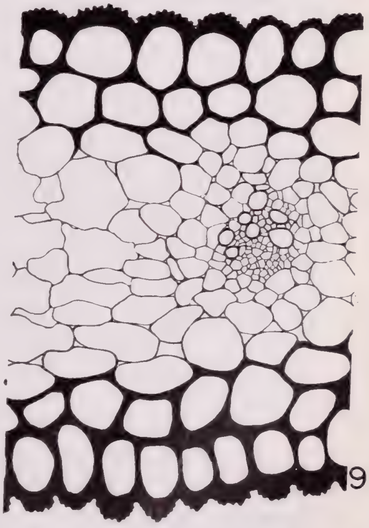
88



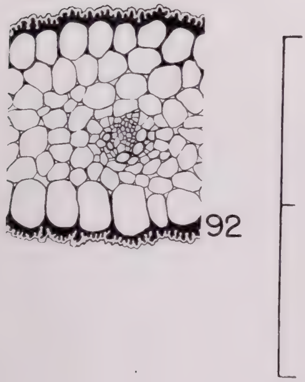
89



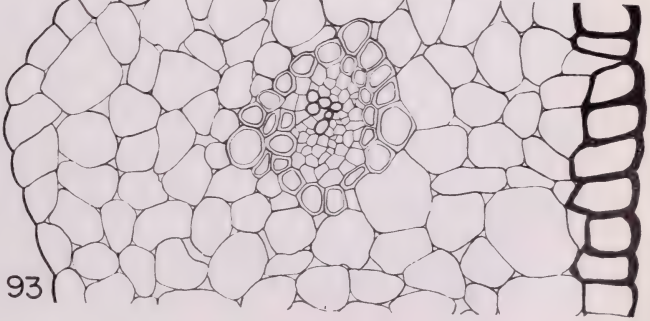
90



91



92



93

Epidermal Relief.

In *Abolboda*, both corolla (fig. 92) and ovary exhibit epidermal relief. Such relief occurs on both surfaces of the corolla lobes. The formation is not merely a cuticular relief. The epidermal wall is raised into delicate, ridged eminences which run, predominantly, in a longitudinal direction on the organ concerned. These eminences are particularly prominent above radial walls of epidermal cells. The cuticle follows outlines of the epidermal cell-wall relief. Outlines of the cuticle, therefore, are parallel to those of the wall relief, but less detailed.

In *Orectanthe sceptrum* subsp. *occidentalis* (fig. 91), similar ridges were observed on the epidermis of corolla lobes, but they are much coarser and less detailed than those of *Abolboda linearifolia*. On the ovary, virtually no relief occurs.

On petals of *Achlyphila disticha* (fig. 93), no appreciable relief could be detected on epidermal cells. On the ovary, however, there are forms of epidermal cell relief which correspond closely with those of *Abolboda linearifolia*. Cuticular relief thus suggests similarity between the two genera.

Anthers.

The anthers in the three genera offer distinctive points of comparison. In *Abolboda* (e.g., *A. linearifolia*, fig. 88), the connective is wide but thin. Between the veins and the anther sacs, the mesophyll of the connective is spongy. The endothecium is a single layer of cells wide. In *Orectanthe sceptrum* subsp. *occidentalis* (fig. 89) the connective is rounded. The endothecium is a single layer of cells wide except at the portions of the anther sacs nearest the connective. The endothecial cells are large, and the thickening bands are narrow. The anthers of *Achlyphila* (fig. 90) have a connective narrowed at their contact with the anther sacs. The connective itself is relatively narrow. The endothecium is a single of cells wide except where it is adjacent to the connective. Thickenings on endothecial cells are relatively wide compared with those of *Orectanthe* and even *Abolboda*. Mention should be made of the conspicuous epidermal relief that occurs on the surfaces of the anther sacs. This feature offers a further point of comparison between *Achlyphila* and other *Xyridaceae*.

Ovary Crests.

The ovary crests of *Abolboda*, a characteristic of that genus, consist of large lignified cells. This is shown for *A. sprucei* in fig. 38.

Capsule Wall.

Mature capsule valves were available only in *Abolboda* and *Orectanthe*. As shown for *A. macrostachya* var. *angustior* (fig. 104) capsule valves in *Abolboda* consist of thick-walled sclerenchyma. Cells at the points where loculicidal dehiscence occurs are small and non-lignified. Likewise, the septa are not lignified, at least in their inner portions, and lignification is likewise absent where the valves are joined to the ovary base. The epidermal cells may be somewhat radially elongate, especially opposite the septa. In the fruits of *Orectanthe* (fig. 105) on the contrary, lignification even in mature fruits is mostly limited to the epidermal layer. Cells in this layer are mostly markedly elongate radially and sclerified.

SEED AND EMBRYO

Ovule.

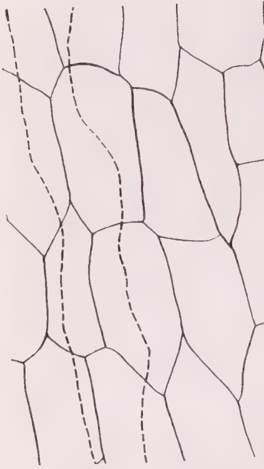
Ovules of all species of *Abolboda* for which appropriate stages were available showed the same features. The ovule is anatropous, with two integuments which are distinct from each other and the nucellus well back into the chalazal region. The integuments are each two cells wide. The megaspore mother cell is separated from the surface of the nucellus by a single layer of cells. The ovules of *A. macrostachya* var. *robustior* showed some degree of wing formation, reminiscent of the condition in *Orectanthe*. Ovules of *Orectanthe* were insufficiently well preserved to gain an accurate idea of their structure. They appear to be decidedly laterally flattened, however, so that a wing, composed on one side of the funiculus and on the other side, of the outer integument, is present. This wing is more than two cell layers in width, and this greater width extends to parts of the ovule other than the wing, as the several layers between epidermis and tanniferous layers in the seed shown in figure 103 indicate. An idea of the extent of the wing can be gained from the figure of the seed of *O. sceptrum* given by Maguire, Wurdack et al. (1958, fig. 1m). The inner integument is not involved in wing formation.

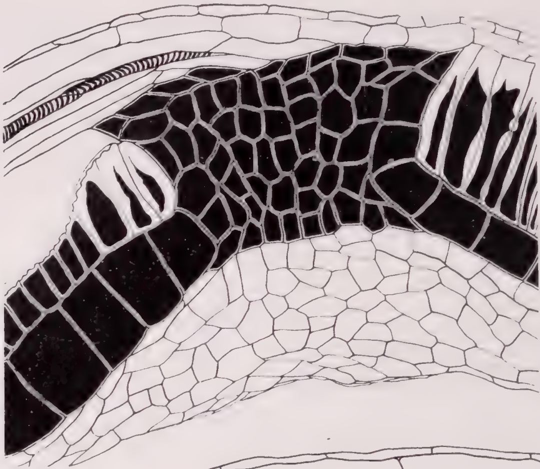
The ovules of *Achlyphila disticha* are identical in structure with those of *Abolboda acicularis* and other species which lack wings; in turn, these conform to the pattern described by Weinzieher (1913) for *Xyris indica*.

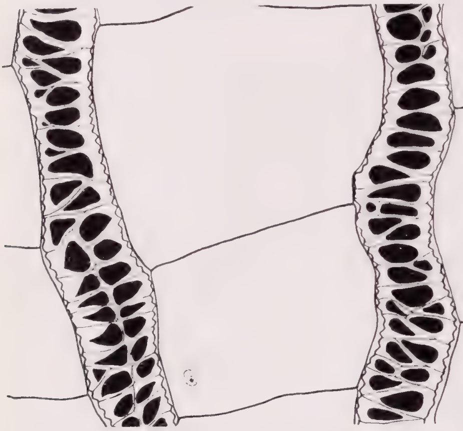
Seed.

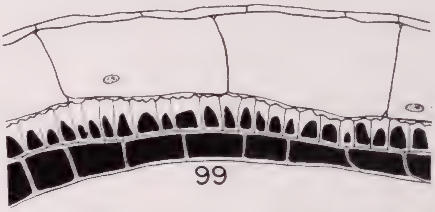
The seed of *Abolboda* is seemingly quite complex because of the four distinctive layer of cells. These four layers are shown in the longitudinal section (fig. 99) as well as the transection (fig. 100) and in the successive ''paradermal'' (tangential) sections shown in figures 94–97. The chalazal-micropylar axis is considered here as the longitudinal axis, and a sagittal section is considered a longitudinal section that passes through the funiculus and bisects the ovule.

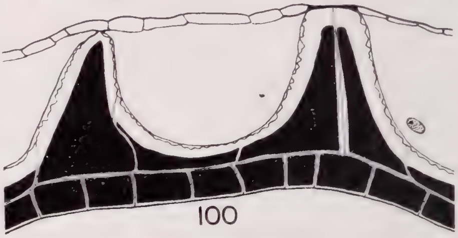
The outermost layer of the seed is collapsed, or nearly so, at maturity. The cells are longitudinally elongate (fig. 94). These cells represent the relatively unmodified epidermis of the ovule. The cells of the hypodermal layer (fig. 95, excepting ridges) are large and highly vacuolate. They are enlarged in such a way as to occupy the valleculae of the wave-crest conformations of the layer beneath (see on fig. 100). The cells of the hypodermis are fewer than those of the epidermis, and are elongate laterally (fig. 95). They lack living contents at maturity. The two cell layers beneath the epidermis and hypodermis are distinctive in that (1) their walls are fairly thick and composed of a substance very refractory to staining, and (2) during their maturation stages, they first accumulate droplets of, then are entirely filled with a resin-like or tannin-like substance which stains bright red with safranin. The outer of these two layers (fig. 96) consists of cells that are tangentially elongate. In places, longitudinal ridges develop because of radial elongation of cells in this layer (fig. 100; tips of these ridges are seen in figure 95). These account for the longitudinal ridges seen in gross aspect on seeds of *Abolboda*, as illustrated by Maguire, Wurdack et al. (1958). The outer cell wall of each cell of this layer shows a relief, which consists of relatively large ridges. There is an adjustment, during maturation, so that cells of the hypodermis occupy spaces between the ridges, but are exceptionally thin atop the ridges.

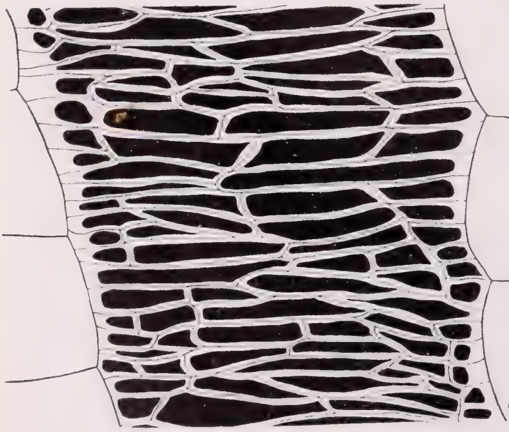

94

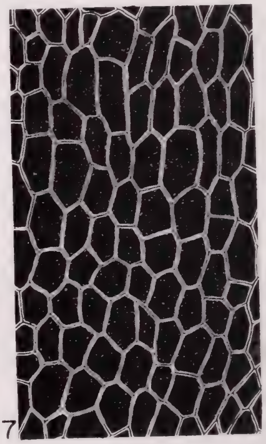

98


95


99


100


96


97

FIGS. 94–97. Parasagittal sections of seed of *Abolboda americana*. FIG. 98. Sagittal section of chalazal end of ovule, showing ovule trace. FIG. 99. Sagittal section of seed coat, The innermost layer (fig. 97) consists of more or less isodiametric cells, with contents as noted above. Cell layers internal to this layer (i.e., nucellar layers) are completely collapsed at maturity, and only a thin membrane of collapsed cell walls separates the endosperm from the innermost layer just mentioned. At the chalazal end of the ovule (fig. 98), the structure is altered. Instead of the four distinctive layers, numerous layers are present. These consist of cells like those of the innermost seed coat layer, with the same dense contents. They form a sort of operculum in the seed. In immature seeds, a number of nucellar layers which might be mistaken for a haustorium are present; during maturation stages, these collapse. The way in which the two layers with contents are altered at the micropyle is indicated in figure 101. The lumen of these cells is quite small in comparison with the thickness of the wall, and a two-layered wall condition is visible in the outer row of cells. Mention should be made of the fact that during maturation of the seed, walls of the cells with contents are obliterated, so that limits between these cells may be difficult to ascertain.

Orectanthe.

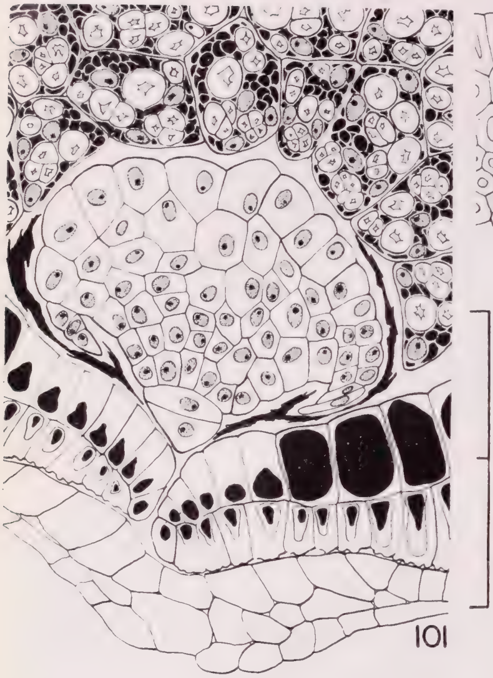
The single section shown (fig. 103) will serve to indicate the nature of the seed coat in this genus. The number of layers outside of the inner two may be greater or fewer than that shown, but is never fewer than three cell layers and usually more, depending on ring formation. The outermost layer of cells consists of thin-walled sclereids. A number of thin-walled but persistent cells are present between the epidermis and the inner pair of cell layers. The persistent tissue is distinctive only in the presence of intercellular deposits, which occur in irregular patches and are of the same material which fills lumina of the innermost pair of cell layers of the seed coat. The inner two cell layers are distinctive, as in *Abolboda*, in their occlusion with the resin-like or tannin-like contents. In origin and nature, these cell layers are precisely homologous with those two layers in *Abolboda*. The outer of these layers does not exhibit the remarkable alteration into ridges which occurs in *Abolboda*, however.

Comparison of Seed Coats in Xyridaceae.

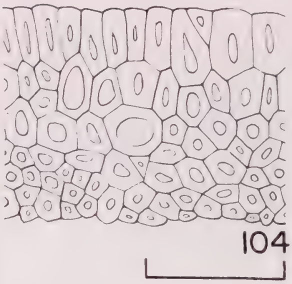
Unfortunately, no seeds of *Achlyphila disticha* were available. There are descriptions of seeds of *Xyris* in the literature, although only for one species, *X. indica* (Weinzieher 1913; Netolitzky 1926). These descriptions show a layer of cells with dark contents, formed into longitudinal ridges on the seeds, which has sculpturing on the outer wall surface and appears to correspond with the similar layers with contents in *Abolboda* and *Orectanthe*. Weinzieher, however, suggests that the origin of this layer is from the inner layer of the outer integument, rather than the outer layer of the inner integument, as is the case in *Abolboda*. Careful comparative studies of ovules in *Abolboda* and *Orectanthe*

---

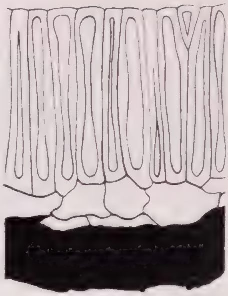
taken between longitudinal ridges. FIG. 100. Transection of seed coat, showing two ridges in sectional view. Figures 94–97 represent successive levels of the seed coat from outside to inside. They can best be understood by visualizing them as four levels, from top to bottom in succession, of the portion shown in figure 100. FIG. 94. Epidermis of seed coat; outline of ridge shown in broken lines. FIG. 95. Hypodermal level, showing two of the longitudinal ridges. FIG. 96. Subhypodermal layer, showing tannin-filled cells of "valley" between two ridges. FIG. 97. Innermost tannin-filled layer. Figures 98–100 show the cell types mentioned. Note thick wall with ridged surface in subhypodermal layer. Scale = 0.2 mm in 0.1 mm divisions.



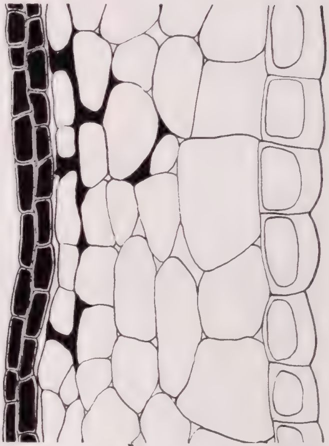
101



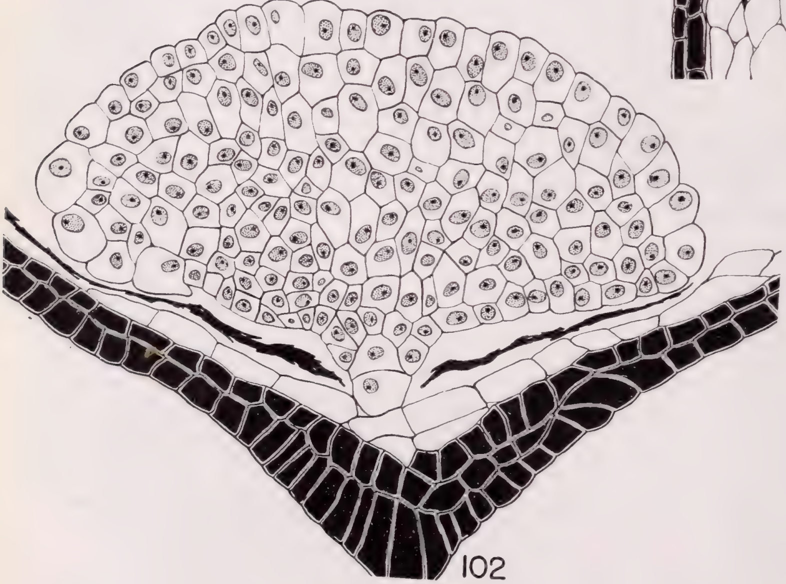
104



105



103



102

FIG. 101. *Abolboda americana,* embryo from sagittal sections of embryo sac. Note basal and hypobasal cell and haustorial "flaps." Endosperm shows many nuclei (stippled) per cell, starch grains (with shrunken hilum indicated), and protein storage globules (black). Micropyle below. FIG. 102. *Orectanthe sceptrum.* Embryo, same view as that shown in figure 101. FIG. 103. *O. sceptrum,* section of seed coat from longitudinal section of seed. Section represents a portion between the prominent wings on the seed, which are therefore not involved in this section. FIG. 104. *Abolboda macrostachya* var. *angustior,* transection of capsule valve.

showed that the outer thin-walled layers, without contents, are derived from the outer integument, whereas the inner pair of cells with occluded lumina are derived from the inner integument. From very casual observations on seeds of *Xyris,* the writer is of the opinion that the respective layers in *Xyris* actually have a similar origin, and that the interpretation of Weinzieher is open to question.

The differences in seed structure between *Abolboda* and *Orectanthe* appear to be very distinctive expressions of the same basic pattern, and may be used both to separate the genera and to emphasize an underlying similarity. The writer believes that seeds of *Xyris,* upon further study, will probably also reveal similar conspicuous variations on a pattern common to the whole family. Study on seeds of *Achlyphila* is needed for the same reasons.

Endosperm.

Weinzieher (1913) and Netolitzky (1926) indicate rounded compound starch grains and protein spheroids in endosperm of *Xyris.* Presumably both of these accounts are based on Weinzieher's study of *X. indica.* All the species for which material was available of *Abolboda* (fig. 101) and *Orectanthe* showed these features. Immature stages in the endosperm of *A. sprucei* showed the multinucleate condition of endosperm cells very clearly.

Embryo.

Weinzieher (1913) has illustrated stages in the development of the embryo of *Xyris indica.* The embryo consists of relatively few cells. A broad, flat cotyledon is evident, but Weinzieher figures no differentiation of a suspensor or any meristematic region. Features like these occur in *Abolboda,* as illustrated for *A. americana* in figure 101. A basal and a hypobasal cell are evident, however. The cotyledon consists of large cells, with dark-staining contents that suggest the haustorial function of this structure which is closely appressed to the endosperm. At the edges of the cotyledon, flap-like extensions are evident. The embryo of *Abolboda americana* shows no differentiation of an apical area, and is larger and composed of more numerous cells than that of *X. indica.* Significantly, the embryo of *Orectanthe sceptrum* (fig. 102) shows precisely the same features as the embryo of *Abolboda americana,* but is larger, corresponding to the larger size of all organs in this species. A basal and a hypobasal cell appear to be present. If a meristematic area is present, it is not appreciably differentiated from other areas of the embryo. Unfortunately, no embryos of *Achlyphila* were available. Likewise, no stages in gametogenesis or early embryo development were visible on account of the nature of preservation.

POLLEN

Methods

Pollen grains of *Xyridaceae* are subject to decomposition by various reagents. As Erdtman (1952) notes, his acetolysis method degrades the exine. Sodium

---

FIG. 105. *Orectanthe sceptrum,* transection of capsule valve. Scale beneath figure 104 applies to figure 105; figure 102, 103 at same scale (between those two figures). All scales in divisions of 0.1 mm.

hydroxide, a reagent commonly used in pollen-preparation techniques, partly or wholly dissolves the exine. Except for two specimens (figs. 112, 120) in which NaOH treatment was very gentle and merely revealed some textural differentiation in the exine—probably because of preferential solubility of certain parts—this substance proved useless. Even the pollen of fixed material which formed the main basis for this study was, in some cases, altered. Because of this extreme sensitivity to a wide variety of reagents, the simplest methods for preparation of pollen grains for observation appeared to be (1) sectioning and staining of flowers (with their included pollen) according to the techniques described at the beginning of this paper; and (2) transferring fixed anthers through an alcohol series to absolute ethyl alcohol, staining in safranin dissolved in absolute ethyl alcohol, and following this by transferring anthers to xylene and making whole mounts of grains in Canada balsam. Undoubtedly both of these techniques resulted in dehydration and perhaps other changes which could alter size and possibly induce artifacts. However, a number of grains in each of the collections studied appeared to be reasonably unaffected, and were considered suitable for study. Note should be made of the fact that the spines (or other excrescences of the exine) that stain bright red are seemingly unchanged by any of the reagents mentioned, and data concerning these are without doubt quite reliable. The exine wall, which stains green with a safranin–fast green combination, is the structure that is sensitive to reagents.

Because the grains are large, and few in number per anther, because good material (grains from anthers just before or at anthesis) were necessarily limited, and because many grains were collapsed, or degenerate, the number of grains that could provide reliable measurements was extremely small. The data on pollen grain diameter below represent, therefore, averages of measurements of only those grains that the writer judged to be turgid and otherwise unaltered in form. On account of the exceptional susceptibility of pollen grains in this family to various changes, truly exact data can probably be obtained only from fresh material. Such material is virtually impossible to view because of the remote locations in which these species grow. Terminology for pollen morphology used below follows the usage of Erdtman (1952).

Pollen Grain Size.

Pollen grains of *Abolboda, Orectanthe,* and *Achlyphila* are sphaeroidal, a fact which may be related to their nonaperturate condition. Because of this shape, only one dimension is necessary. Dimensions do not include the spines or other excrescences.

Species	*Diameter in microns*
Abolboda acaulis (fig. 106)	84
A. acicularis var. *acicularis* (fig. 107)	96
A. bella (fig. 108)	110
A. ciliata (fig. 109)	96
A. ebracteata (fig. 110)	90
A. grandis var. *guayanensis* (fig. 111)	150
A. linearifolia (fig. 112)	120
A. macrostachya var. *angustior* (fig. 118)	155
A. macrostachya var. *macrostachya* (fig. 119)	105

A. macrostachya var, *robustior* (fig. 120))	180
A. sprucei (figs. 114–117)	120
Orectanthe ptaritepuiana (figs. 121–124)	
Steyermark & Wurdack 523	165
Steyermark & Wurdack 1221	165
Maguire et al. 32823	140
O. sceptrum (figs. 125–127)	140
Achlyphila disticha (figs. 128, 129)	32

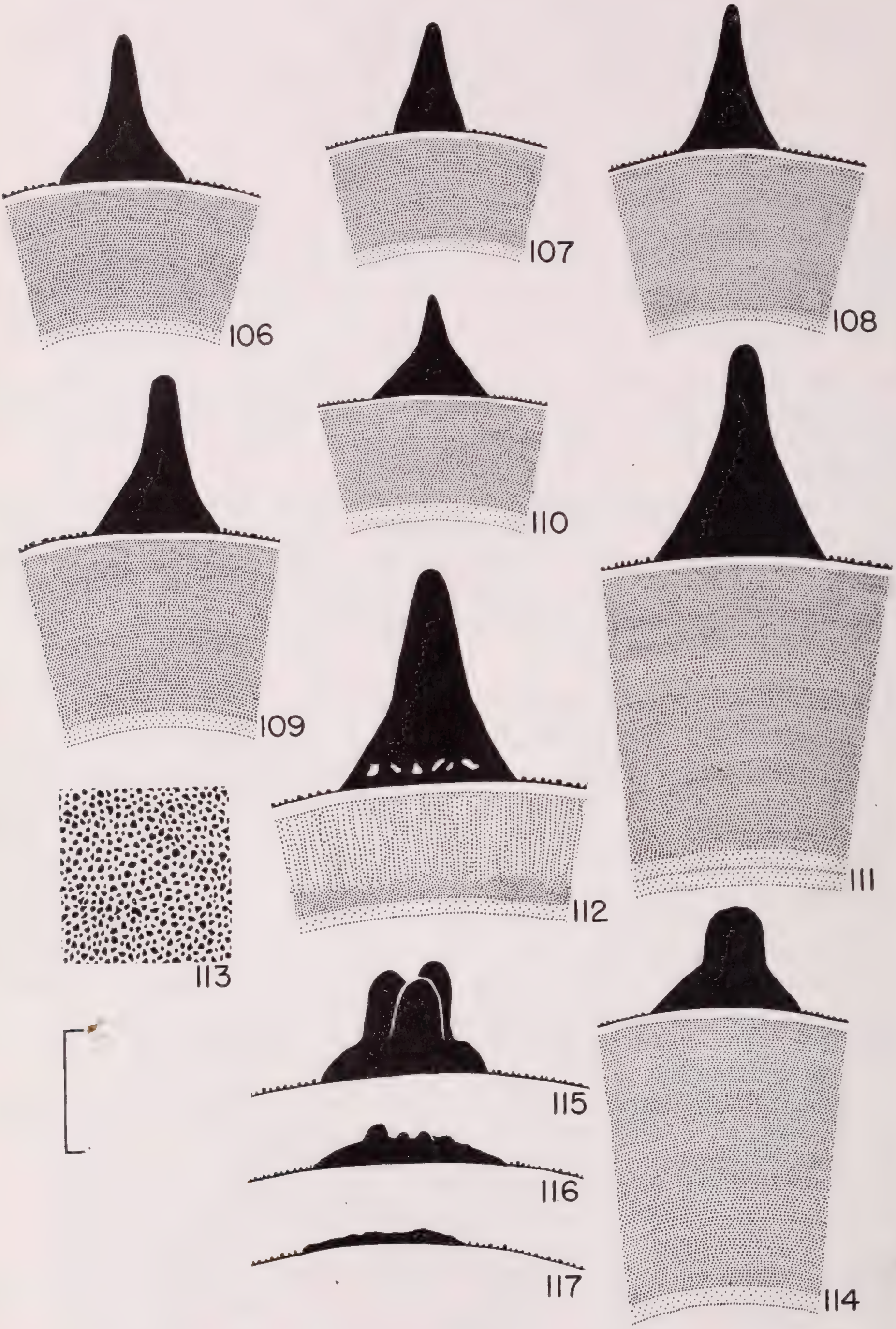
Within the genus *Abolboda*, some taxa seem obviously to have larger pollen grains than others; species with exceptionally large grains include *A. linearifolia*, *A. macrostachya* (at least in part), *A. grandis*, and *A. sprucei*. The pollen grains of *Orectanthe* are markedly larger, in general, than those of *Abolboda*. The markedly smaller diameter of *Achlyphila* pollen grains is interesting; this size is comparable to the sizes reported by Erdtman (1952) for species of *Xyris*. Pollen grains of *Xyris*, as described below, do differ in morphology from those of *Achlyphila*.

Previous reports on pollen-grain diameter include those of Malme (1933) on "*Abolboda*" (now *Orectanthe*) *sceptrum* ("about 105 μ") and Erdtman (1952) for *Abolboda poarchon* ("105 μ"), *A. pulchella* ("105 μ"), and *A. vaginata* ("at least 75 μ"). Maguire, Wurdack et al. (1958) give the following measurements: *Abolboda bella*, 120–140 μ; *A. paniculata*, 140–150 μ; and *Orectanthe* (as a genus), 160–250 μ.

Pollen Grain Wall ("sporoderm").

Sectioned material showed two distinct parts of the pollen grain wall in all taxa: the inner portion, which stains brightly with fast green, and the spines, or other ornamentation (including the minute pila on the surface of the interspinal areas), which stain bright red with safranin. These two portions appear to correspond with Erdtman's definitions of nexine and sexine respectively, except that a thin layer, which stained pale green, on the inner surface of the pollen grain wall in *Abolboda* could be interpreted as the intine. This interpretation was suggested by observation of germinating pollen grains on a style of *A. grandis*. In these, this layer covered the emerging pollen tube. Such a layer could not be distinguished in pollen grains of *Orectanthe*, possibly because of difficulties in preservation, but a comparable layer did appear present in grains of *Achlyphila* (fig. 128).

The nexine in sectioned material and in whole mounts appears to stain homogenously in most preparations. In two preparations in which sodium hydroxide had been employed (fig. 112, 120), radial fibrillae or striae appeared to be present in the outer two-thirds of the nexine. This appearance may have been caused by differential solution of materials in the nexine, or by expansion of the wall by means of the treatment. Among the various taxa, the nexine thickness appears to be a distinctive character. In most of the *Abolboda* species studied, it appears to range between 5 and 7 μ. It is much thicker than that in *A. grandis* var. *guayanensis*, *A. macrostachya* var. *macrostachya*, *A. macrotachya* var. *robustior*, and *A. sprucei*. Certainly the great thickness of the nexine of *A. grandis* var. *guayanensis* and *A. sprucei* represents a distinctive characteristic. In *Orectanthe*, the nexine does not appear to exceed 5 μ in thickness. In *Achlyphila*, the width of this layer is about 3 μ.


106
107
108
109
110
111
112
113
114
115
116
117

FIGS. 106–117. View of pollen grains in species of *Abolboda.* All figures except figures 113, 115–117 represent a portion of a median microtome section of a pollen grain, and have been drawn to show one of the large ornaments; intine is indicated below by sparser stippling. FIG. 106. *A. acaulis.* FIG. 107. *A. acicularis* var. *acicularis.* FIG. 108. *A. bella.* FIG. 109.

The outermost layer of the pollen grain wall, or sexine, is basically a thin membranous layer which may be partly detached in damaged grains. Minute pila (seen in surface view, figs. 113, 129) are embedded in this membrane. A feature that seems quite important to the writer does not seem to have been mentioned in the literature on *Xyridaceae* pollen grains, namely, that these minute pila are, in fact, homologous with the large spines or knob-like ornaments in *Abolboda* and *Orectanthe*. These larger excrescences are deposited on the membranous layer just as the pila are, and appear to be composed of the same material, despite the vast difference in size between the two types of ornamentation on the same grain. Rarely, as in *Orectanthe sceptrum* (fig. 125), knobs transitional in size between these two categories may be observed. The pila in *Orectanthe* are noticeably larger than those in *Abolboda*. Pollen grains of *Achlyphila* (figs. 128, 129) show the largest pila of any of the grains studied here. In *Achlyphila*, the pila tend to be aggregated in flake-like patches. In places between these patches, the pilate layer is absent. In *Abolboda*, a thin hyaline layer was observed immediately beneath the pilate layer. Such a layer may also occur in pollen grains of *Orectanthe* and *Achlyphila*.

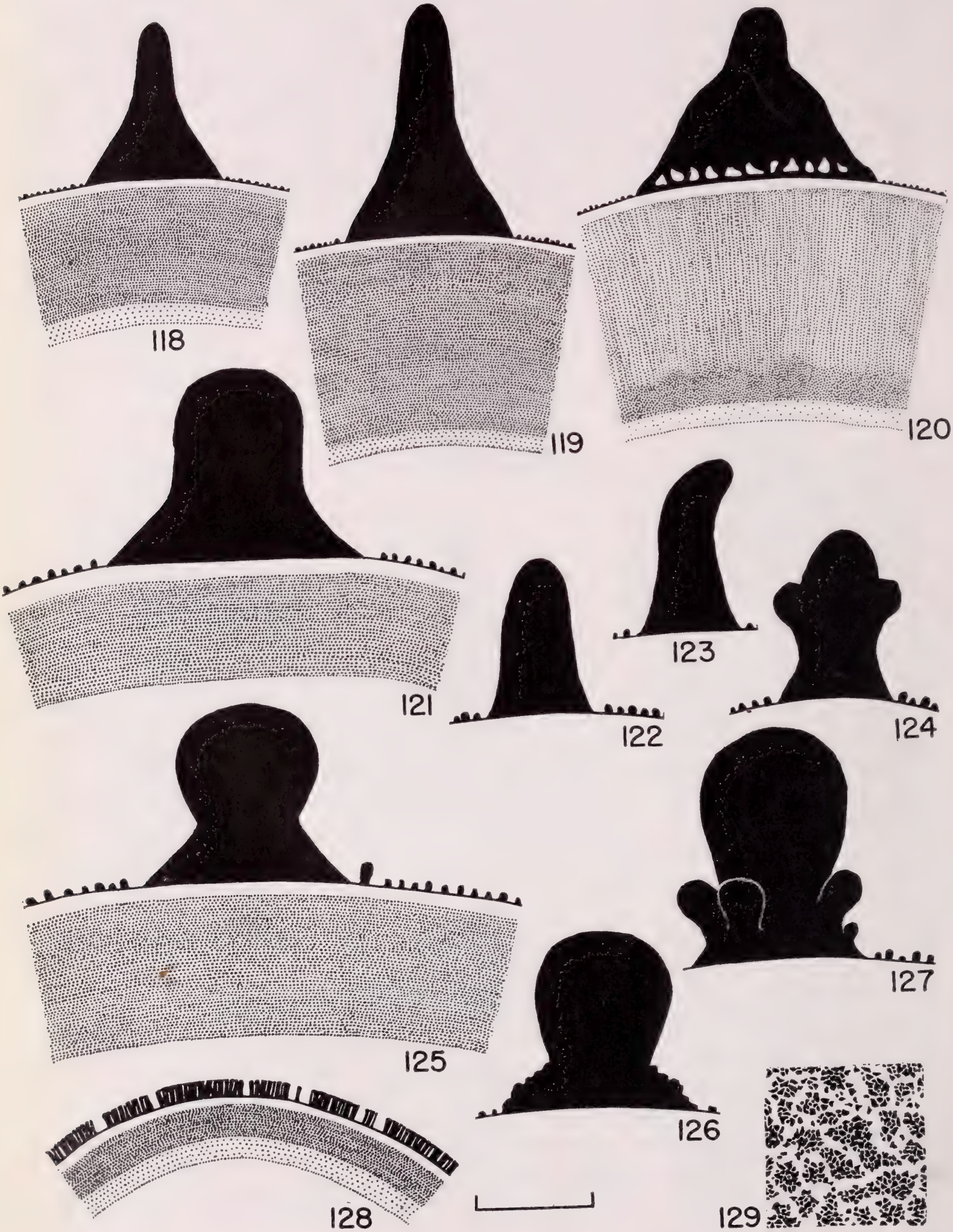
The spines on pollen grains of *Abolboda* are so characteristic of that genus, and are so subject to distinctive variations in the species, that they have been figured for all the species studied (figs. 106–120). Basically, as in *A. acaulis* or *A. linearifolia*, they have an inverted funnelform shape. Sodium hydroxide treatment (figs. 112, 120) reveals that lacunae, not visible in other preparations, are probably present in the spine base. Some species show markedly narrow spines: *A. bella* (fig. 108), *A. acicularis* (fig. 107), and *A. ciliata* (fig. 109). Very short, wide spines occur in *A. ebracteata* (fig. 110) and *A. macrostachya* var. *robustior* (fig. 120). The three varieties of *A. macrostachya* appear different on the basis of spine size and shape. Within a single flower of *A. sprucei*, various alterations in spine shape were noted. The basic condition seems to be that shown in figure 114, but multiple spines on a single base (fig. 115), very much reduced lobes (fig. 116), and merely the vestige of the spine-base (fig. 117) were also observed.

Erdtman (1952) has illustrated the spines of pollen grains of three species and given dimensions: *A. poarchon* (spines 8.3 μ long; basal diameter 5.5 μ), *A. pulchella* (spines 9.3 μ long; basal diameter 8.3 μ), and *A. vaginata* (spines 8.3 μ long; basal diameter 8 μ). Erdtman figures spines in the latter species which appear about like the spines in *A. macrostachya* var. *angustior*.

The comparable ornamentation on pollen grains of *Orectanthe* is generically different from that of *Abolboda*. In *Orectanthe*, the emergences take the form of a large knob, or other shape much wider and more blunt than the spines of *Abolboda*, with the possible exception of the much smaller structures in *A. sprucei*. In *O. ptaritepuiana* (figs. 121–124) a variety of shapes was noted, varying with the collection from which the grain was taken: short, with a rounded apex (fig. 121), elongate (fig. 122), with a curved apex (fig. 123), or with folds or bulges on the sides (fig. 124). Evidently considerable variation is

---

A. ciliata. Fig. 110. *A. ebracteata.* Fig. 111. *A. grandis* var. *guayanensis.* Fig. 112. *A. linearifolia* (from NaOH-treated specimen). Fig. 113. Same, surface view of interspinal sexine ornamentation. Fig. 114. *A. sprucei.* Fig. 115–117. Same, variations (within a single flower) or ornament shape. Scale = 5 μ.


118
119
120
121
122
123
124
125
126
127
128
129

FIGS. 118–129. Views of pollen grains. Conventions as in figures 106–117. FIG. 118. *Abolboda macrostachya* var. *angustior*. FIG. 119. *A macrostachya* var. *macrostachya*. FIG. 120. *A. macrostachya* var. *robustior* (from NaOH-treated specimen). FIG. 121. *Orectanthe ptaritepuiana*. FIGS. 122–124. The same, variations in ornament shape. FIG. 125. *O. scep-*

present in these characters. In preparation of pollen grains in this species, the knobs appeared to be sunken in slight depressions; this may well be an artifact of fixation or preparation. The knobs of *Orectanthe sceptrum* pollen grains are different from those of *O. ptaritepuiana* in that the apical portion is widened, so that a capstan-like shape is achieved. The only variation in structure of these knobs is found in the formation of additional small knobs on the base (fig. 127) as compared to the normal condition (fig. 125), or the formation of a roughened base (fig. 126).

Discussion.

In summary, the pollen grains of the three genera show excellent generic characters. The presence of large excrescences in *Orectanthe* relates this genus closely to *Abolboda,* but the differing shape is a good generic character. Likewise, the larger pila in the surface between emergences differentiates *Orectanthe* from *Abolboda.* The absence of such large emergences in *Achlyphila,* and the grouping of pila into flake-like aggregations on the exine surface, marks this genus off from other genera of *Xyridaceae.* Within *Abolboda,* differing exine widths and distinctive spine shapes and sizes serve to differentiate the species, so that of the species studied, most could be identified by means of the pollen grains alone. Similar considerations apply to distinctions between the two species of *Orectanthe.*

Erdtman (1952) has emphasized the great distinction between *Abolboda* and *Xyris* in pollen-grain structure. Much of this distinction may be attributed to the large spines on the surface of *Abolboda* pollen grains. The lack of such larger ornaments on grains of *Achlyphila,* which are (like those of *Abolboda,* but unlike those of *Xyris*) nonaperturate, may vitiate this contrast, and provide an intermediate form. The pilate layer in pollen grains of *Abolboda, Orectanthe,* and *Achlyphila* probably has a counterpart in *Xyris.* The presence of the pilate layer, although different in each genus, tends to provide a common characteristic, as does the rather thick nexine, lacking in lipophilic compounds. The writer suspects from Erdtman's reports of both ''OL'' and ''LO'' sexine patterns that a layer of united pila may compose the sexine in at least some *Xyris* pollen grains. The exine of *Achlyphila* seems midway between that of *Abolboda* and *Orectanthe* on one hand, and *Xyris* on the other. The relatively thick, baculate sexine and the thin nexine of *Xyris* pollen grains do not seem at odds with the condition in *Achlyphila.* Probably the three major patterns represent striking variations on the same basic pattern. Careful work is needed both to provide additional data on *Xyris* and to demonstrate whether the affinity Erdtman (1952) suggests between the grains of the *Abolboda*-type and those of *Liliaceae* and *Zingiberaceae* is close or not.

SUMMARY

The writer has found that an attempt to summarize anatomical characteristics of genera of *Xyridaceae* in chart form is virtually impossible because (1)

---

trum. FIGS. 126–127. The same, variations in ornament shape. FIG. 128. *Achlyphila disticha.* FIG. 129. The same, surface view of sexine ornamentation (pila). Scale = 5 μ.

there are exceptional species within a genus; (2) reference to particular conditions in lengthy anatomical terms, or with the aid of illustrations is necessary; and (3) some relatively subtle characteristics cannot be summarized in this manner. The most important anatomical lines of evidence are cited below, and the reader is referred to the foregoing descriptions, particularly to the "discussion" section terminating each of the major portions above.

Specific Characteristics.

1. *Abolboda.* Characteristics of leaf anatomy and stem anatomy suggested recognition of two species-groups, termed here "smaller-stemmed" abolbodas and "larger-stemmed" abolbodas. Recognition of these as subgenera would probably be premature. Within each of these groupings, leaf and stem anatomy suggest specific characteristics also. Characteristics other than these do not emphasize the two species-groups as much as they suggest characteristics of individual species. The large stele of roots defines *A. macrostachya,* but genuinely remarkable specific characteristics are offered by the peculiar patterns of endodermis-cell thickening. In the inflorescence axis, thickness of sclerenchyma ring, presence of fibrous sheaths on pith bundles, and sclerification of epidermal cells offer a number of characteristics. Distinctive patterns in number of bundles, size, sclerenchyma and chlorenchyma presence and distribution offer further characteristics in sepals, and, to a lesser extent, in bracts. Perhaps the best specific characteristics are evident in pollen in such respects as shape and size of spines, nexine thickness, and diameter.

2. *Orectanthe.* Anatomical features by which *O. ptaritepuiana* may be differentiated from *O. sceptrum* include relative lignification of the central portion of the stem; thickness, epidermal sclerification and shape of bundles in leaves; distribution of parenchyma in the sepals; size and sexine ornamentation of pollen grains.

Generic Differences.

The closest relationships among genera of *Xyridaceae* is that between *Abolboda* and *Orectanthe.* Segregation of the latter genus is well deserved, however. *Orectanthe* has larger stems with a distribution of sclerenchyma different from that in *Abolboda. Orectanthe* has more bundles in its leaves, more bundle-sheath extensions, a tendency towards abaxial hypodermis production, and no thorn-like leaf-tip with peculiar tracheids. It has spongy chlorenchyma and lignified bundle sheaths in the cortex of the inflorescence axis. It has distinctive sepal size and anatomy, and the inflorescence-axis bract is notably lacking in sclerenchyma or other differentiation. *Orectanthe* lacks staminodia, has more elaborate corolla venation, and a massive anther connective. Capsule-valve anatomy and especially seed anatomy provide excellent characteristics to distinguish the two genera. Pollen morphology provides an exemplary instance of a generic degree of distinction between *Abolboda* and *Orectanthe.*

Achlyphila could probably be defined, on the basis of present knowledge, on a number of anatomical features. The root offers peculiar endodermis characters and vessels well toward the interior of the core, which, however, lacks central vessels. The stem shows modifications corresponding with its rhizomatous habit, such as a stem endodermis. The leaves have a peculiar equitant habit, and the central core of lignified parenchyma in upper portions is peculiar. The flattened inflorescence axis, lacking veins in the "pith" region, is distinctive. Sepal anatomy could be used to separate *Achlyphila* from the other genera, and floral venation reveals both a lack of staminodia and a choripetalous condition. Pollen is peculiar because it combines a peculiar patch-like presence of long pila with a lack of major ornaments and a nonaperturate condition.

Detailed comments cannot be made on *Xyris*, because it has been excluded from this study. Such characteristics as lack of "pith" bundles in the inflorescence axis, distinctive seed anatomy, and the peculiar nature of the monosulcate pollen provide features which, as extended descriptions would show, amply enforce the generic distinction of *Xyris* within the family.

Composition of Xyridaceae: Relationships of the Four Genera.

In respect to either gross morphology or anatomy, three relatively isolated groups are apparent: (1) *Abolboda* and *Orectanthe;* (2) *Achlyphila;* and (3) *Xyris*. Before showing the anatomical common denominators among these groups, similarities among pairs of genera may be mentioned.

Abolboda and *Orectanthe*, as mentioned above, are amply distinct, but the resemblances are close. For example, the presence of style appendages and their venation pattern is a striking similarity. Winged seeds occur both in *Orectanthe* and, to some degree, in *Abolboda macrostachya*. Seed-coat anatomy of the two genera reveals two variations on the same basic pattern, as do the embryos. The inflorescence axis in both genera contains bundles in the "pith" region. Most significantly, perhaps, both genera possess pollen grains in which an outer layer contains both minute pila and large spine- or knob-like ornaments.

Abolboda resembles *Xyris* in exhibiting a similar range of anatomical characteristics in roots. Equitant leaves and compound bundles in leaves occur in both genera. The embryo of *Abolboda*, although larger than that of *Xyris*, is very similar. Better knowledge of seed anatomy in *Xyris* might reveal similarities in this respect.

Abolboda is like *Achlyphila* in relatively few aspects, because the relationship of *Achlyphila* to *Xyris* appears closer. In addition to features common to all genera mentioned below, one may mention resemblances in epidermal relief in flowers, identical ovules, similarities in floral venation, and certain features of root anatomy and inflorescence-axis structure.

Relationships between *Achlyphila* and *Xyris* include those of equitant leaves and their anatomical consequences, the presence of sclerified epidermis and undulate epidermal contours on leaves, the lack of bundles in the "pith" region of the inflorescence axis, and resemblances in pollen. The pollen of both genera lacks the differentiation of sexine into major and minor ornaments, and is relatively small in diameter.

Review of anatomical characteristics reveals a number in which the genera are alike, or in which the genera appear as variations on a common basis. One significant feature is the presence of vessel elements with simple perforation plates in all parts of the plant. As the work of Cheadle (1942) shows, this high degree of specialization occurs in only a few families of monocots. The amount of similarity among the three genera in this study in respect to floral venation is remarkable, and study of *Xyris* might enable inclusion of that genus in this respect. The choripetalous condition in *Achlyphila* is really not appreciably different from the tubular condition of the corolla in *Abolboda* and *Orectanthe*, and the venation reveals no appreciable alterations in this respect. To be sure, *Achlyphila* is less specialized in its choripetalous condition, but one might assume that presence of staminodia was a primitive character in *Abolboda*. Certainly the development of style ("ovary") appendages in *Abolboda* and *Orectanthe* are advanced characteristics, whatever their significance may be. Unfortunately comparable data is not available on seed anatomy for the four genera, but I suspect that this will reveal a common basis upon which variations have been evolved. Similar considerations also apply to morphology of the embryo; the three genera for which this is now known all have the same peculiar type, with variations chiefly in size. The most significant anatomical character in *Xyridaceae* with respect to difficulties in interpretation might seem to be pollen morphology. Much has been made of the difference between *Abolboda* (with *Orectanthe*) and *Xyris* in these respects. Because monosulcate pollen is so basic in the monocots, the nonaperturate condition in *Abolboda*, *Orectanthe*, and *Achlyphila* would seem to be derived. If this were true, one might also expect a more primitive exine condition in *Xyris* also. The lack of differentiation of the sexine elements, and their even distribution, appear to be unspecialized. Exine in *Achlyphila* consists of only one type of sexine element, small pila arranged in flake-like patterns. This ornamentation is close to that of *Xyris*, in the writer's opinion, although *Achlyphila* is like the other two genera in the nonaperturate condition. The most logical explanation of the exine in *Abolboda* and *Orectanthe* seems to be that differentiation into two types of elements—minute pila and large spines or knowbs—has taken place; this differentiation most likely would have started from a condition like that found in *Achlyphila*. The relatively thick nexine, lacking in lipophilic compounds, offers a common basis among the genera. More study of *Xyris* pollen is required before a definite phylesis can be suggested, but the above interpretations appear most likely at the present moment.

The reader will note that the taxonomic conclusions expressed above bear a very close resemblance to those of Maguire, Wurdack, et al. (1958, 1960). The writer agrees with these authors in their conclusion that the four genera of *Xyridaceae* are highly distinctive, but show more common resemblance than any resemblance of any one to a genus of another family. The writer was pleased to find, in addition, that his anatomical material lends such clear-cut support to specific and even subspecific (*Abolboda macrostachya*) designations of these authors.

Literature Cited

Arber, Agnes. 1925. Monocotyledons. 1–258.

Carlquist, S. 1958. Anatomy of Guayana *Mutisieae*. Part II. Mem. N. Y. Bot. Gard. **10:** 157–184.

Cheadle, V. I. The occurrence and, types of vessels in the various organs of the plant in monocotyledons. Am. Jour. Bot. **29:** 441–450.

Erdtman, G. 1952. Pollen morphology and plant taxonomy. 1–539.

Maguire, B., Wurdack, J. J. & *collaborators*. 1958. The botany on the Guayana Highland—Part III. Mem. N. Y. Bot. Gard. **10:** 1–156.

————. 1960. The botany of the Guayana Highland—Part IV. Mem. N. Y. Bot. Gard. **10:** 000–000. Pages to be supplied in proof.

Malme, G. 1925. Xyridologische Beiträge. Ark. Bot. **19**(13): 1–8.

————. 1933. Beiträge zur Kenntniss der südamerikanischen Xyridazeen. Ark. Bot. **25**(12): 1–18.

Netolitzky, F. 1926. Anatomie der Angiospermensamen. *In*: K. Linsbauer [ed.], Handbuch der Pflanzenanatomie II. **IOD**: 1–364.

Solereder, H. & Meyer, F. J. 1929. *Xyridaceae. In*: F. J. Meyer [ed.], Systematische Anatomie der Monokotyledonen **4**: 36–50.

Weinzieher, S. 1913. Beiträge zur Entwickelungsgeschicte von *Xyris indica* L. Flora **106**: 393–432.

ANNOUNCEMENT

Beginning 1 January 1960, all back issues of MEMOIRS OF THE NEW YORK BOTANICAL GARDEN will be handled exclusively by Stechert-Hafner, 31 East 10th Street, New York 3, N. Y. Current issues will be handled as heretofore by the Garden. Claims for missing issues should be directed to the Garden.

Stechert-Hafner will perform the same service for back issues of all serials published by The New York Botanical Garden and will reprint parts that have become exhausted. Prices of parts and volumes may be had on application to Stechert-Hafner.

LIB
NEW
BOTA
GA

MEMOIRS

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME 10, NUMBER 3

A Revision of Spathiphyllum (Araceae) .... GEORGE S. BUNTING 1

Issued 30 November 1960

The Memoirs of The New York Botanical Garden are issued at irregular intervals in parts of various sizes. Approximately 500 pages will complete a volume. The subscription price of volume 10 is $10.00. Number 3 may be purchased separately for $2.00. Authors of papers may obtain separate copies of their contributions, printed at the same time as the issue, at cost price.

For further information address the editor:

H. W. Rickett
The New York Botanical Garden
New York 58, N. Y.

NOV 1960 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN 10(3):1–53

A REVISION OF SPATHIPHYLLUM (ARACEAE)

George S. Bunting
Missouri Botanical Garden
St. Louis, Missouri

INTRODUCTION

The genus *Spathiphyllum* forms an inconspicuous element in the flora of tropical America, although it is widespread from Mexico to Peru and Brazil. Two species occur only on Pacific islands, one on Cocos Island (some 300 miles off the Costa Rican coast) and another in Indonesia and the Philippines. Most species of *Spathiphyllum* grow at elevations between 100 and 1000 m above sea level, frequently in the foothills of mountains or in river valleys. They are plants of permanently wet or moist, shady places that may be inundated at times. They often form colonies along the margins of rivers and streams.

Attempts to identify recent Guayanan collections and other material of *Spathiphyllum* suggested the need to further investigate the classification of this genus. Subsequently, about 1000 specimens were critically examined. Deep appreciation is expressed to the directors and curators of the many herbaria from which specimens were borrowed.[1]

HISTORY OF THE GENUS

Before the publication of *Spathiphyllum* in 1832, two species had been described that are now included in this genus. Jacquin in 1790 (Collectanea **4**: 118) described *Dracontium lanceaefolium*. In 1803, *Pothos cannaefolia* was clearly illustrated and characterized in *Curtis's Botanical Magazine* (*pl. 603*).

Schott, having described *Spathiphyllum* in 1832 (Melet. Bot. 22), listed "Sp. lanceaefolium Schtt. (Dracontium lanceaefolium Jacq.)" and "Sp. sagittaefolium Schtt." It appears that he followed Sprengel, who in his revision of Linnaeus' *Systema naturae* (Syst. Veg. **3**: 766. 1826) had included these two species in the genus *Dracontium* along with *D. podophyllum* L. Schott correctly excluded the last species.

The two species included with the original description of *Spathiphyllum* are not congeneric, though both have trimerous flowers with perianth, a superficially acaulescent habit, and long petioles geniculate at the apex. Schott's treatment was followed by Endlicher (Gen. Pl. **1**: 240. 1836) and by Kunth (Enum. Pl. **3**: 83. 1841).

In 1849, Liebmann described the genus *Hydnostachyon* (Vid. Meddel. **1-2**: 23), differentiated from *Spathiphyllum* by its unilocular ovary. Critical examination of the specimens referred to that genus fails to verify this unilocular condition. Schott placed *Hydnostachyon* in synonymy under *Spathiphyllum* in 1853.

---

[1] Abbreviations for herbaria used in the text are those of Lanjouw and Stafleu, Index Herb. 2(1):106–117 (1952).

In 1852, Carl Koch, impressed by the truncate, cuplike perianth of a plant then cultivated as "Pothos cannaefolia" and "Monstera cannaefolia," designated this plant as type of a new genus, *Massowia*, and published the combination *M. cannaefolia* (Bot. Zeit. **10**: 277–278). Apparently he was unaware that this species had been described in the genus *Spathiphyllum* by Poeppig and Endlicher (Nova Gen. Sp. Pl. **3**: 85. 1845) as *S. candicans*.[2] *Massowia* was placed in synonymy under *Spathiphyllum* by Schott in 1853, when he finally delimited his diagnosis of *Spathiphyllum* to exclude *S. sagittaefolium*[3] and expanded it to include related genera of other authors. Koch in 1856 (Bonplandia **4**: 10–12) published a sharp rebuttal of Schott's nomenclatural action.

Schott, in his *Genera Aroidearum* (1858), described *Spathiphyllum* and presented a full-page plate of the reproductive structures of *S. blandum*. Two years later he presented his *Prodromus Systematis Aroidearum*, a monograph of the entire family with partial keys to the species, in which 22 species of *Spathiphyllum* were treated.

Engler (Gard. Chron. II. **7**: 140. 1877) erected the genus *Amomophyllum*, distinguished by the shape of the ovary and its uniovulate locules. In 1879 (in DC. Monogr. Plan. **2**: 227) he altered the rank of *Amomophyllum* to that of a section of the genus *Spathiphyllum*.

The last monograph of *Spathiphyllum*, prepared by Engler and Krause, appeared in *Das Pflanzenreich* (**4**^{23B}: 118–134. 1908). It was a good treatment, obviously representing new investigations undertaken since publication of the *Monographie*. Twenty-seven species and four varieties were treated.

GENERIC RELATIONSHIPS

The aroid genus *Spathiphyllum* is generally considered rather primitive.[4] Its perfect flowers (with perianth) are borne on a spadix without a sterile appendage, and the spadix is subtended by a more or less flat or cochleariform, persistent, rather foliaceous spathe. The geniculate apex of the petiole and the well-developed spathe are its only advanced characteristics, except in the few species whose perianth is formed into a 4–6-sided, truncate cup.

Engler and Krause (Pflanzenreich **4**^{23B}: 118–134. 1908) considered *Spathiphyllum* to be most closely related to *Holochlamys* because the perianth in the latter genus is a 4-sided cup similar to that in *S. commutatum*. *Holochlamys* is similar in habit and foliage to *Spathiphyllum*, but is more advanced. Its ovary is unilocular with many ovules arising on long funiculi from a basal placenta, and generally the spathe is convolute about the spadix.

Hutchinson (Fam. Fl. Pl. **2**: 119. 1934) placed *Holochlamys* in the *Lasieae* near *Podolasia* because its spathe more or less embraces the spadix. On the contrary, the unfurled and rather foliaceous spathe of *Spathiphyllum* led Hutchinson to retain only this genus in the *Spathiphylleae*, which he considered to be more primitive than the *Anthurieae*, and advanced only in relation to the *Acoreae*

---

[2] *S. candicans* = *S. cannaefolium*

[3] Schott erected the new genus *Urospatha* to receive *S. sagittaefolium*.

[4] The advanced conditions are: unisexual flowers (without perianth), and a spadix with a sterile appendage, enveloped in a well-differentiated spathe.

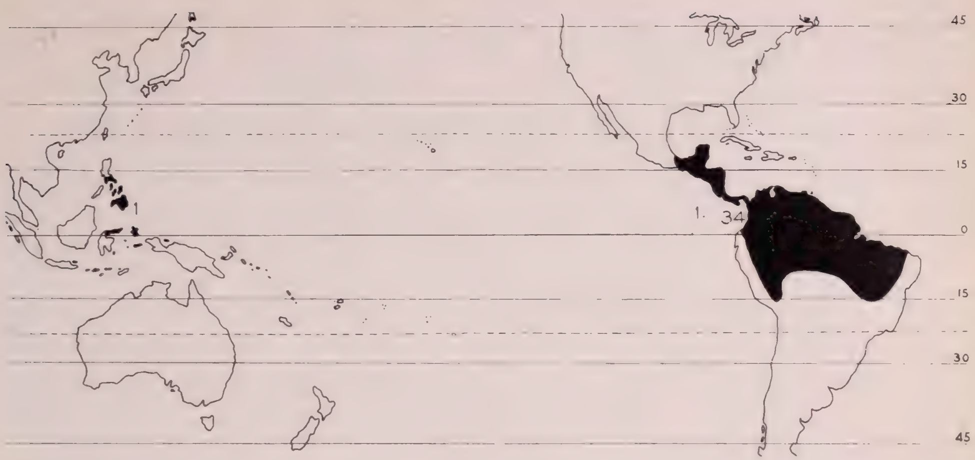


FIG. 1. Geographic distribution of *Spathiphyllum*. Numerals indicate the number of species in each area. Note the presence of a single species (*S. laeve*) on Cocos Island, and another (*S. commutatum*) in the Indonesian-Philippine area.

and *Orontieae*. This treatment appears to be completely natural, and suggests that of Schott (Gen. Aroid. 1858), who placed *Spathiphyllum* between *Anthurium* and *Orontium*.

Spathiphyllum is often confused with *Stenospermatium* and *Rhodospatha*. The latter two genera differ from *Spathiphyllum* in having flowers without perianth, a somewhat convolute spathe deciduous at anthesis, and a stem with elongate internodes.

MORPHOLOGY

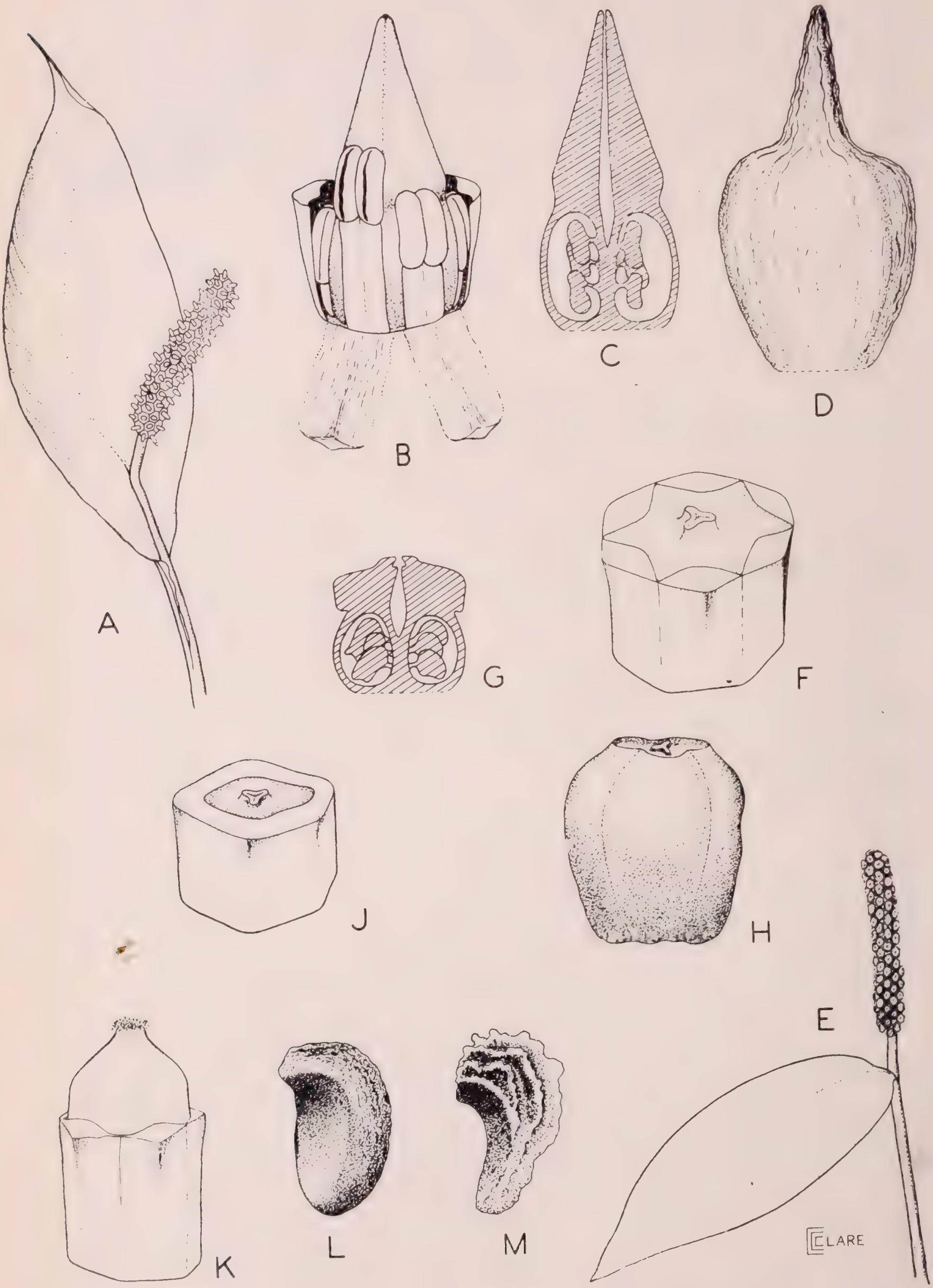
The sections of *Spathiphyllum* are differentiated by (1) the discreteness or union of the perianth segments, (2) the form of the style and its length in relation to the perianth, and (3) the manner of attachment of the spathe upon the peduncle. Species differences are much less outstanding. The variation and the relative taxonomic merit of each structure are discussed below.

Leaf-blade. The length/width ratio of the blade is a constant feature useful in differentiation of many species of *Spathiphyllum*, while the absolute size of the blade varies greatly. Shape of the blade is an important species characteristic, but the point at which the blade is widest varies somewhat. Texture of the blade is difficult to evaluate, especially in specimens glued firmly to an herbarium sheet, and is rarely considered in separating species.

The base[5] of the leaf-blade may be acute or obtuse to subrotund, and is relatively constant within a species. It is noteworthy that the broad leaf-base

---

[5] The ''base'' of the leaf-blade here indicates the lower one-third or one-fourth of the blade where the leaf-margins converge toward the midrib; it should not be confused with the ultimate narrowing of the blade in some species into a small deltoid process.


A
B
C
D
G
F
J
H
E
K
L
M
CLARE

occurs mostly in species of sect. *Spathiphyllum*. The number of primary lateral veins and the angle at which they arise from the midrib seem to be constant features valuable in identification.

Petiole. Though the petiole is similar in most species, the geniculum[6] may be exceptionally long or occasionally alate.

Inflorescence. The length/width ratio and the shape of the spathe are essentially constant for a species. Texture of the spathe is rarely an important species characteristic. In most species, color of spathe varies with age of inflorescence.

The spadix (as a unit) has little taxonomic value. In many species, it is borne on a free stalk, here called the stipe; this term always refers to the more or less terete, free apical portion of the peduncle between the point of attachment of the spathe on the peduncle and the base of the spadix. The length of the stipe is sometimes a good diagnostic characteristic.

Flowers. The perianth furnishes adequate sectional differences only, except in two species in which the apex of the perianth is distinctively modified. This characteristic has not been previously recorded. In most other works on aroids, the perianth segments are designated as sepals or tepals. Since the 4–6(–7) perianth segments occur in a single series in *Spathiphyllum*, the terms "perianth" and "perianth segments" are used throughout this paper.

Specimens were examined in which the stamens appear to be of reduced size, but my study of these structures was inconclusive because of the small amount of material and the variability in the size of the stamens within a single flower (Fig. 2B).

The pistil may be attenuate and exserted beyond the perianth, or inflated, annular, and/or truncate and scarcely exceeding the perianth. The proportional length of the exserted portion in respect to the length of the perianth may characterize a species, but more commonly a group of species, or a section.

Ovary differences, relied upon heavily by Engler and others for separation of species of *Spathiphyllum*, are of limited taxonomic value in this genus. In some species the number of locules per ovary is reduced from the usual three to two, yet the bilocular situation may result by abortion only in some individual flowers of a spadix. In his key to the species, Engler emphasized the number of ovules per locule. My investigations have shown that this characteristic may be misleading. The number of ovules is sometimes inconstant from flower to flower and plant to plant. Moreover, the number of ovules in the locules of a single pistil is not equal; one locule tends to have one or occasionally two ovules more than the others. The largest number of ovules in any locule is significant, a smaller number simply indicating that a reduction has occurred.

---

[6] The geniculum is the thickened distal end of the petiole found in several genera of *Araceae* and in other families.

FIG. 2. A–D. Reproductive structures typical of species of *Spathiphyllum* sect. *Spathiphyllum*. A. Inflorescence (somewhat reduced). B. Flower, × 10. C. Longitudinal section of pistil. D. Fruit, × 6. E. Inflorescence typical of species of sections *Massowia*, *Amomophyllum*, and *Dysspathiphyllum* (somewhat reduced). F–H. Repreduceive structures typical of species of sect. *Amomophyllum*. F. Flower, × 10. G. Longitudinal section of pistil. H. Fruit (also typical of species of sect. *Massowia*), × 6. J. Flower typical of species of sect. *Massowia*, × 10. K. Flower of *S. humboldtii* (sect. *Dysspathiphyllum*), × 10. L. Seed with more or less smooth surface, × 12. M. Seed with furrowed and verrucose surface, × 12.

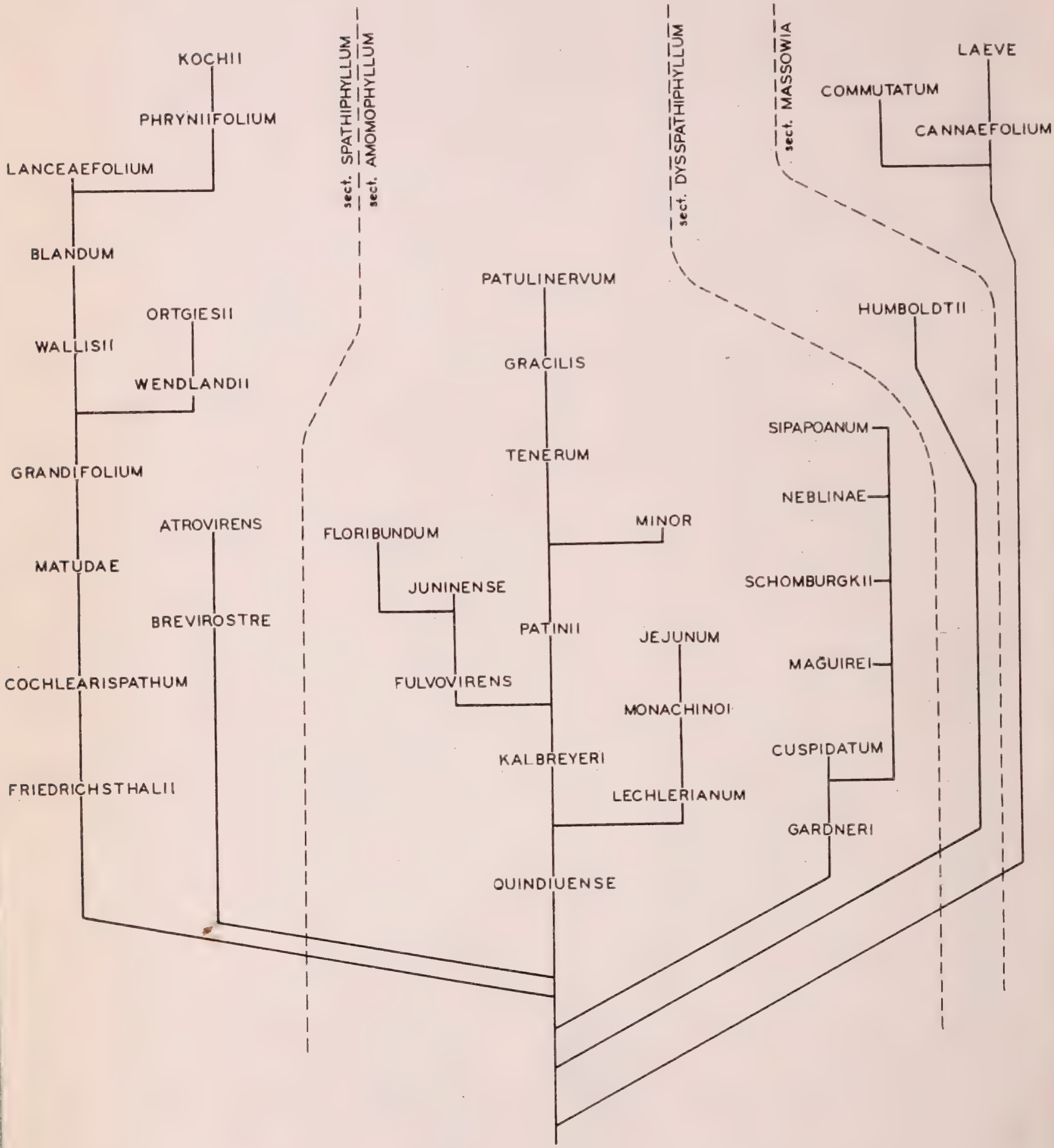

sect. SPATHIPHYLLUM
sect. AMOMOPHYLLUM
sect. DYSSPATHIPHYLLUM
sect. MASSOWIA
KOCHII
PHRYNIIFOLIUM
LANCEAEFOLIUM
BLANDUM
ORTGIESII
WALLISII
WENDLANDII
GRANDIFOLIUM
ATROVIRENS
MATUDAE
BREVIROSTRE
COCHLEARISPATHUM
FRIEDRICHSTHALII
FLORIBUNDUM
JUNINENSE
FULVOVIRENS
PATULINERVUM
GRACILIS
TENERUM
MINOR
PATINII
KALBREYERI
QUINDIUENSE
JEJUNUM
MONACHINOI
LECHLERIANUM
LAEVE
COMMUTATUM
CANNAEFOLIUM
HUMBOLDTII
SIPAPOANUM
NEBLINAE
SCHOMBURGKII
MAGUIREI
CUSPIDATUM
GARDNERI

FIG. 3. Suggested relationships in *Spathiphyllum*.

DEVELOPMENTAL TRENDS

The species of sect. *Massowia* appear to represent a phylogenetic offshoot of great age. The union of their perianth segments into a 4–6-sided cup probably was an evolutionary advance of ancient occurrence, since each of the three species with this characteristic occurs in an area widely separated from the others. *S. cannaefolium*, the most widespread of all the species of *Spathiphyllum*, is restricted to northern South America east of the Andes, and is the only species on the island of Trinidad. *S. laeve* is restricted to Cocos Island in the eastern Pacific. *S. commutatum* occurs in the same latitude as *S. cannaefolium*, but on the opposite side of the Pacific Ocean, where it is distributed on several islands in Indonesia and the Philippines. These species are remarkably similar, and surely must be monophyletic in origin.

S. humboldtii, the sole species of sect. *Dysspathiphyllum*, appears to be a variable species of wide range in South America. It is an enigmatic group of obscure alliance. Its flowers are frequently reduced to a bimerous condition, while the locules of the ovary are mostly multiovulate. There is a remote resemblance between this species and *S. cuspidatum* and *S. gardneri* (here placed in sect. *Amomophyllum*). Possibly these three species arose from a common ancestral stock, or perhaps hybridization has been a prime factor in their derivation.

Species of the sections *Spathiphyllum* and *Amomophyllum* occur in Colombia in close contact. This investigation has revealed little to suggest that one of these groups developed from the other. It is more probable that they arose from a common ancestral stock that no longer persists. That stock may have possessed characteristics similar to those of *S. quindiuense*, and perhaps also gave rise to the species of sect. *Massowia*.

There is clearly a progressive reduction in the number of ovules per locule in species of sections *Spathiphyllum* and *Amomophyllum*, which trend is correlated with a reduction in size of the plant in the latter section. This reduction has guided me in arrangement of the species within each section.

The diagram of relationships (Fig. 3) suggests the possible origin and interrelationships of the species.

COLLECTIONS AND TYPIFICATION

The most important single assemblage of aroids, deposited at Vienna where Schott had worked, was totally destroyed by fire in 1945. Nearly as serious was the loss (through war action) of many aroid collections at Berlin, where Engler had worked. Most species of *Spathiphyllum* whose types were destroyed may be recognized from their descriptions and illustrations.[7] A few, however, have been difficult to distinguish because of the lack of definitive material, especially *S. lanceaefolium*, the type species of the genus. It has seemed appropriate to designate neotypes from some of these species.[8] For others the original descriptions are considered as types,[9] and a representative collection is cited to exemplify my interpretation of each.

---

[7] Excellent illustrations accompanied the original descriptions of many species of this genus; at Vienna original plates by Schott are preserved that illustrate many species; for two species there are authentic photographs of the type specimens made before those specimens were destroyed.

[8] International Code of Botanical Nomenclature (1956), Art. 7.

[9] Op. cit., Art. 10.

Of several species described from living plants in cultivation apparently no specimens were preserved by their authors. The fine illustrations that accompany the original descriptions of most of these species serve to differentiate them.

POLLEN STUDY

Following Wodehouse's technique of pollen preparation (Erdtman, Introd. Pollen Anal. 31. 1943), observations were made of pollen grains from about ten species of *Spathiphyllum* (selected at random). The grains were found to be subprolate or ovoid, without pores, and the sexine is vaguely striate but smooth at the ends of the grains. The principal difference between species appears to be the size of the grains, which probably has taxonomic significance only statistically. Erdtman in 1952 (Pollen Morph. Pl. Taxon. 56, 57) described the pollen grains of *S. cannaefolium* and *S. patinii;* he illustrated a grain of the latter species.

Very detailed comparative studies of pollen, in conjunction with chromosome studies[10] of the Pacific *S. commutatum* and the American species, especially *S. cannaefolium,* may be rewarding.

ECONOMIC IMPORTANCE

Several species of *Spathiphyllum* are prized for the unique beauty of their inflorescences, and are cultivated either under glass or out-of-doors in warm regions. *S. wallisii* (*S.* ''clevelandii'') is most often grown, and it is not exceptional to see the blossoms offered for sale at better flower shops in New York. Plants of *S. wallisii* are quite tolerant of artificial light and low atmospheric humidity. They make excellent additions to large combination planters, although flowering may be reduced under such conditions. *S. floribundum* and *S. cochlearispathum* are often seen in cultivation, and several other species thrive in the conservatory of The New York Botanical Garden.

In the Soconusco region of Chiapas, Mexico, and along the Pacific slope of Guatemala and El Salvador, the natives eat the young spadices (called ''huisnay'') of *S. matudae* either cooked with eggs or cooked and pickled in vinegar.

ACKNOWLEDGEMENTS

This investigation was conducted primarily at The New York Botanical Garden. I am deeply indebted to that institution for making available its entire facilities to me, and to its director and staff for their untiring assistance throughout the pursuit of this project. Most sincere thanks are due Dr. Bassett Maguire, who directed the research, facilitated field work in Venezuela for me, and offered valuable suggestions in preparation of this manuscript. The kind assistance of the following persons has been most valuable in the completion of this work: Dr D. D. Keck, Head Curator, Dr H. W. Rickett, Bibliographer, and Miss Elizabeth C. Hall, Librarian (all of The New York Botanical Garden).

A note of thanks is due Dr Thomas Pray, who arranged study facilities for me at the herbarium of the Hancock Foundation at the University of Southern California, and to Dr E. Y. Dawson of the Los Angeles County Museum for his assistance.

---

[10] Darlington & Ammal (Chromosome Atlas Cult. Pl. 303. 1945) reported the somatic chromosome number of *S. patinii* as 18 (x = 9), determined by Matsuura & Suto (1935). This entry was deleted from the latest edition of the *Chromosome Atlas* (Darlington & Wylie 1955).

I am grateful to Mr Alfred B. Graf for making available for study all the aroids growing at the Julius Roehrs Company, Rutherford, New Jersey, and to the numerous other horticulturists who have shared their knowledge and collections in an effort to clarify the nomenclature of cultivated plants.

SYSTEMATIC TREATMENT

Spathiphyllum Schott, Melet. Bot. 22. 1832.

Hydnostachyon Liebm. Vid. Meddel. 1–2: 23. 1849.
Massowia K. Koch, Bot. Zeit. 10: 277–278. 1852.
Spathiphyllopsis Teijsm. & Binn. Natuurk. Tijdsch. Ned. Indie 25: 400. 1863.
Amomophyllum Engl. Gard. Chron. II. 7: 139. 1877.

Perianth of 4–6(–7) green or white segments, separate or conglutinate or connate toward the base, apically thickened and often truncate, inflexed, imbricate, accrescent in age, or the perianth a 4–6-sided fleshy cup, the apex truncate; pistil commonly white in flower, green in age, subcylindric or obpyramidal, apically truncate or attenuate-conic, equaling or exceeding the perianth, the stigma coronate or elevated, (2–)3-lobed, often brush-like; ovary (2–)3-locular, the ovary walls containing trichosclereids; septa membranous, ± free from one another above, connate below along their inner margins, forming a hollow, cylindrical axis (axile placenta) bearing the ovules, (the septum centrally pierced in 2-locular ovaries); ovules ± oblong in lateral outline, anatropous, (8–)5–1 per locule, superposed or collateral, imbedded in a transparent, insoluble but hydrophilous matrix that fills each locule; placentation axile; stamens as many as the perianth segments and opposite them, the filaments broad, oblong, lengthening in age, the anthers basi-dorsifixed, not versatile, yellow or whitish, nearly as wide as long, 2-celled, the sides subparallel, their dehiscense longitudinal and extrorse; fruiting spadix smooth or tuberculate; fruit obovoid to ovoid, often long- or short-rostrate; seeds few to many, oblique-ovoid to reniform or oblong in profile, often very angular, yellowish, the surface smooth or verruculose between ± vertical rows of foveola.

Glabrous herbs 2–12 dm tall, the many leaves arising from an abbreviated rhizome partially visible above the soil and rooted on the lower side; cataphylls very narrowly attenuate-lanceolate, abaxially bicarinate, often two-thirds as long as the petiole or longer; petioles mostly equaling or longer than the blade, terete above, alate and vaginate below, equitant, apically geniculate; the geniculum to 5 cm long, sulcate above and occasionally alate; leaf-blades arching outwardly, simple, entire, marginally undulate, lanceolate or oblong to elliptic or oblanceolate, 2–many times longer than wide, the apex acuminate-cuspidate and the base attenuate or acute to obtuse or subrotund, the midrib wide, flattened and prominent above, very conspicuous beneath, triangular to semicircular in cross section, the few to many pairs of primary lateral veins subparallel and arcuate toward the apex, impressed upon the usually glossy upper surface, salient on the paler under surface, with usually one secondary and two tertiary lateral veins between two primary veins. Inflorescence scapoid, the peduncle geniculate at the apex, commonly holding the spathe and spadix erect above the arched foilage; spathe at first convolute, becoming cucullate or plane and erect or reflexed, white or green, lanceolate or elliptic to ovate, rarely oblanceolate, the apex pointed, the base acute to obtuse and decurrent upon the peduncle or non-decurrent; spadix terminal on the peduncle, erect, cylindrical throughout, (the flowers congested or loosely arranged), shorter than the spathe, sessile or on a free stipe to 4 cm long.

Type species: *Spathiphyllum lanceaefolium* (Jacq.) Schott, Melet. Bot. **1**: 22. 1832.

Key to the Sections and Species of *Spathiphyllum*

A. Spathe usually non-decurrent on the peduncle; style various, never attenuate-conic.
B. Perianth a 4–6-sided cup, the apex entire, truncate. sect. 1. *Massowia.*
C. Blade of the leaf 1.5–3 times as long as wide; spathe mostly 3–4 times as long as wide.
D. Leaf-blade typically oblanceolate to narrow elliptic, 2.5–3 times as long as wide; spathe 3–5 times as long as wide. South America, Trinidad. 1. *S. cannaefolium.*
DD. Leaf-blade typically broad elliptic, 1.5–2.5 times as long as wide; spathe mostly 2.5–3 times as long as wide. Indonesia, Philippines. 2. *S. commutatum.*
CC. Blade of the leaf narrower, 3.5 times as long as wide; spathe more than 5 times as long as wide. Cocos Island. 3. *S. laeve.*
BB. Perianth segments separate, at least apically.
E. Pistil scarcely exceeding the perianth, the apex subtruncate. sect. 2. *Amomophyllum.*
F. Ovules 6–3(–2) in each locule, totaling 14–6 ovules per ovary; if totaling 7–6, the primary lateral veins rising at an angle of 15–30° (to 45° in *S. cuspidatum, kalbreyeri*).
G. Plants 4 dm or more tall (sometimes shorter in *S. quindiuense*).
H. Leaf-blade narrowly elliptic, 5–9 times as long as wide.
J. Spathe pergameneous; stigma coronate, not conspicuous above the perianth. Colombia, Panama. 4. *S. quindiuense.*
JJ. Spathe chartaceous; stigma nipple-like, conspicuous above the perianth. Venezuela. 5. *S. monachinoi.*
HH. Leaf-blade wider, 3–5 times as long as wide.
K. Spathe to 10 cm long, 2–3 times as long as wide; stipe of the spadix ca. 0.5 cm long. Brazil. 6. *S. gardneri.*
KK. Spathe to 20 cm long, 3–5.5 times as long as wide; stipe of the spadix 1–2.5 cm long.
L. The spathe lanceolate or elliptic, 3–5 times as long as wide. British Guiana. 7. *S. cuspidatum.*
LL. The spathe oblong, 5–5.5 times as long as wide. Colombia. 8. *S. kalbreyeri.*
GG. Plants 3 dm or less tall.
M. Ovules superposed, totaling 14–10 ovules per ovary. Peru, Colombia (?). 9. *S. lechlerianum.*
MM. Ovules collateral, affixed on a sub-basal pad in each locule, totaling 9–5 ovules per ovary.
N. Peduncle subequaling the petiole; leaf-blade 7–9 times as long as wide. West-central Venezuela. 10. *S. jejunum.*
NN. Peduncle twice as long as the petiole; leaf-blade wider.
O. Blade of the leaf lanceolate, the base short acute. British Guiana. 11. *S. maguirei.*
OO. Blade of the leaf elliptic, widest at the middle and equally attenuate toward either end.
P. Spadix 3–4 times as long as the stipe; leaf-blade 6–8 times as long as wide. Mt. Roraima, Venezuela. 12. *S. schomburgkii.*
PP. Spadix equaling to twice as long as the stipe; leaf-blade wider, 4.5–5.5 times as long as wide. Cerro de la Neblina, Venezuela. 13. *S. neblinae.*
FF. Ovules (3–)2–1 in each locule, totaling 7–2 ovules per ovary; if totaling 7–6, primary lateral veins arising at an angle of 45–75°.
Q. Leaf-blade 2–3 times as long as wide; primary lateral veins arising at an angle of 60–75°.
R. Petiole subequaling the leaf-blade. Colombia. 14. *S. floribundum.*
RR. Petiole much longer than the leaf-blade.

S. Spathe 4–6 times as long as wide; stipe of the spadix ca. 0.5 cm long. Panama, Andean Colombia. 15. *S. fulvovirens.*

SS. Spathe 3–4 times as long as wide; stipe of the spadix to 1.5 cm long. Eastern side of Andes in Peru. 16. *S. juninense.*

QQ. Leaf-blade 4–8 times as long as wide; angle of the primary lateral veins various; or the blade wider with the primary laterals arising at an angle of 25–45° (except in *S. tenerum*).

T. The locules of the ovary 2–1-ovulate, totaling 6–4 ovules per ovary.

U. Primary lateral veins arising at an angle of 45° or less.

V. Blade of the leaf 4–5 times as long as wide; primary lateral veins arising at an angle of ca. 45°. Cultivated. 17. *S. patinii.*

VV. Blade of the leaf 7–8 times as long as wide, primary lateral veins arising at an angle of ca. 25°. Cerro Sipapo, Venezuela. 18. *S. sipapoanum.*

UU. Primary lateral veins arising at an angle of 60–65°. Amazonian Peru. 19. *S. tenerum.*

TT. The locules of the ovary uniovulate, totaling 3–2 ovules per ovary.

W. Plant ca. 2 dm tall; leaf-blade ca. 4 times as long as wide. Peru. 20. *S. minor.*

WW. Plant 3–4 dm tall; leaf-blade 6–7 times as long as wide.

X. Primary lateral veins arising at an angle of 30–40°. Peru. 21. *S. gracilis.*

XX. Primary lateral veins arising at an angle of 75–80°. Ecuador. 22. *S. patulinervum.*

EE. Pistil 1.5–2 times as long as the perianth, the style ± oblong, apically blunt and shortly narrowed into a brush-like stigma. sect. 3. *Dysspathiphyllum.* 23. *S. humboldtii.*

AA. Spathe conspicuously decurrent upon the peduncle for 2–10 cm; style usually attenuate or conic and exceeding the perianth. sect. 4. *Spathiphyllum.*

Y. Ovules mostly 8–6 per locule; exserted portion of the style 3 or more times as long as the perianth; base of the leaf-blade cuneate-acute. Nicaragua to Panama and Pacific-coastal Colombia. 24. *S. friedrichsthalii.*

YY. Ovules 5–1 per locule; exserted portion of the style not more than twice as long as the perianth; base of the leaf-blade various; or the exserted portion of the style 3 times as long as the perianth, the base of the leaf-blade obtuse.

Z. Base of the leaf-blade broadly obtuse to subcordate; some locules of the ovary 5–4-ovulate; style attenuate or conic.

a. Geniculum 2.5–5 cm long.

b. Leaf-blade mostly 50–65 cm long. Gulf-costal Mexico. 25. *S. cochlearispathum.*

bb. Leaf-blade mostly 35–45 cm long. Pacific Mexico, Guatemala, El Salvador. 26. *S. matudae.*

aa. Geniculum 2 cm long. Southern Colombia. 27. *S. grandifolium.*

ZZ. Base of the leaf-blade acute, or if obtuse, all locules of the ovary 2–1-ovulate or the pistil apically subtruncate.

c. Leaf-blade lanceolate, 3.5–4.5 times as long as wide; petiole slender, never alate in upper portion. Much cultivated. 28. *S. wallisii.*

cc. Leaf-blade various, mostly 2–3 times as long as wide; petiole stout, often alate nearly to the geniculum.

d. Base of the leaf-blade decurrent and forming a wing on the geniculum.

e. Apex of the perianth segments fimbriate and/or deeply notched. Costa Rica. 29. *S. wendlandii.*

ee. Apex of the perianth segments entire, erect and forming a collar around the style. Mexico. 30. *S. ortgiesii.*

dd. Base of the leaf-blade non-decurrent; geniculum not alate.

f. Pistil subtruncate, constricted between the annular style and the ovary.

g. Base of the spathe decurrent on the peduncle 5.5–10 cm. Costa Rica. 31. *S. atrovirens.*

gg. Base of the spathe decurrent on the peduncle 2.5–4.5 cm. Mexico. 32. *S. brevirostre.*

ff. Pistil not truncate, the style attenuate or conic.

h. Base of the leaf-blade acute.

j. Leaf-blade widest at the middle. Caribbean Honduras, Guatemala, British Honduras. 33. *S. blandum.*

jj. Leaf-blade widest below the middle. Coastal Venezuela. 34. *S. lanceaefolium.*

hh. Base of the leaf-blade obtuse.

k. Primary lateral veins arising at an angle of ca. 45°; spadix on a stipe 1.5–3 cm long. Venezuela. 35. *S. kochii.*

kk. Primary lateral veins arising at an angle of ca. 60°; spadix. subsessile. Costa Rica, Panama. 36. *S. phryniifolium.*

Section 1. Spathiphyllum sect. **Massowia** (K. Koch) Engl. in DC. Monogr. Phan. **3**: 228. 1879. Figure 2J.

Massowia subg. *Eumassowia* K. Koch. Bonplandia **4**: 11. 1856.

Spathe generally flat, reflexed, and typically non-decurrent upon the peduncle; perianth formed into a usually fleshy, 4–6-sided cup, apically truncate, entire; pistil cylindric-obpyramidal, apically truncate or subtruncate and not exceeding the perianth (sometimes attenuate and exceeding the perianth in *S. commutatum*). Plants of various sizes.

Type species: *Spathiphyllum cannaefolium* (Dryand.) Schott, Aroid. **1**: 1. *pl. 1.* 1853.

Distribution: northern South America east of the Andes; Pacifica.

1. S. cannaefolium (Dryand.) Schott. Aroid. **1**: 1. *pl. 8.* 1853. Figure 4.

Pothos cannaefolia Dryand. Bot. Mag. **17**: *pl. 603.* 1803.
Pothos cannaeformis H. B. K. Nova Gen. Sp. **1**: 76. 1815.
Monstera cannaefolia Kunth, Enum. Pl. **3**: 61(p.p.). 1841.
Spathiphyllum candicans Poepp. & Endl. Nova Gen. Sp. Pl. **3**: 85. *pl. 295.* 1845.
Massowia cannaefolia C. Koch, Bot. Zeit. **10**: 277–278. 1852.
Spathiphyllum bonplandii Schott, Oesterr. Bot. Wochenbl. **7**: 158. 1857.
Anthurium dechardi André, Ill. Hortic. **24**: 28. *pl. 159.* 1877.
Massowia dechardi Koch, Gard. Chron. II. **10**: 623. 1878.
Spathiphyllum cannaeforme (Curtis) Engl. in Mart. Fl. Bras. 3^2: 103. *pl. 16, fig. 2.* 1879–1882.

Leaf-blade typically oblique, narrowly to broadly oblanceolate varying to elliptic, 25–45(–52) cm long and (5–)8–16(–24) cm wide, commonly widest above the middle, the apex acute or acuminate, or broadly rounded and ending in a deltoid cusp, the base mostly long-cuneate or simply acute; primary lateral veins many, close together, arising at an angle of 35–45°; petiole equaling the blade, 18–40(–59) cm long, prominently alate quite to the geniculum or less, the wing apically auriculate, early deteriorating into fibrous remains on older leaves; geniculum (1.2–)2–3.5(–5) cm long. Peduncle mostly 1.5–2 times as long as the blade, 35–70(–100) cm long; spathe reflexed, typically lanceolate, varying to oblong or elliptic, 10–22(–28) cm long and 2.5–6.5(–9) cm wide, the apex short- to long-acuminate, the base commonly cuneate to somewhat obtuse, ± clasping the peduncle or narrowed into a short handle, white above, green below; spadix 4.5–12(–20) cm long, smooth, on a stipe 0.5–2(–3) cm long; perianth formed into a fleshy, 4–6-sided truncate cup, nearly concealing the pistil and stamens within; pistil cylindric-obpyramidal, the apex truncate, the stigma coronate; anthers exserted in anthesis; ovary 3(–4)-locular, the ovules ± collateral, affixed on a sub-basal pad in each locule, varying from 6–2 in each of the 3 locules, totaling (24–)19–6 ovules per ovary; fruiting spadix smooth; fruit spheroid, the apex truncate; seeds as many as the ovules, mostly irregularly ovoid and very angular, to 3.5 mm long and half as wide, the surface furrowed and foveolate, especially on the outer face, the ridges irregular and verruculose.

Type Collection: ''Hort. Kew, 1790.'' (holotype BM). Though described from a plant growing in the Royal Garden at Kew, the original description (Bot. Mag. **17**: *pl. 603.* 1803) states that ''a specimen which flowered there in the month of April 1790, is preserved in the Banksian Herbarium.''

Distribution: Widespread in moist forests of northern South America, throughout the Guayana highlands westward to the base of the Andes, northward to the Atlantic coast in Venezuela, eastward to Trinidad and British Guiana, but apparently absent from the Amazon basin east of the Río Negro.

BRAZIL: Amazonas: Bocca do Tefé, June 1906, *Ducke 7325* (MG); no Rio Papuri, Rio Uaupés, Oct 1945, *Fróes 21187* (NY); Trinidade, Rio Papuri, Dec 1913, *Luetzelburg 23873* (M); Varadouro, Rio Uaupes, Nov 1916, *Luetzelburg 23969* (M).

BRITISH GUIANA: Bonisika Landing, Arawau R., Jul 1934, *Archer 2333* (US); Arokyma Falls, Potaro R., Nov 1907, *Bartlett 8745* (K); Macca Falls, Waini R., Jul 1906, *Beckett & Kortright 8502* (K); Mabaruma, Aruka R., Northwest Dist., Mar 1945, Br. Guiana For. Dept. 5124 (NY); Northwest Dist., Waini R., Sep 1921, *de la Cruz 1121* (G, NY, US); Pomeroon R., Pomeroon Dist., Dec 1922, *de la Cruz 3128* (NY); Kamakusa, Upper Mazaruni R., ca. 59°50′ W long., Jul 1923, *de la Cruz 4095* (F, G, MO, NY, US); Issorora, Aruka R., lat. 8°10′ N, long. 59°50′ W, *Hitchcock 17570* (G, NY, S, US); Pomeroon R., Dec 1882, *Jenman 1625* (NY); Warm Falls, Pomeroon Dist., Feb 1883, (*Im Thurn*) *Jenman 1952* (K); Nov 1886, (*Sherring*) *Jenman 3577* (K); Barima R., Mar 1896, *Jenman 6989* (NY).

COLOMBIA: Arauca or Boyaca: Esmeralda, Río Casanare, Los Llanos, Oct 1938, *Cuatrecasas 3843* (US), *3844* (US), *3844b* (US). Caquetá: Florencia, cerro de La Sardina, Mar 1940, *Cuatrecasas 8927* (COL, US); Florencia, orillas Río Sombra, Dec 1930, *Arbeláez 710* (COL, US). Meta: Villavicencio, Jan 1876, *André 1175* (K); orillas del Río Guatiquía, en los alrededores de Villavicencio, Nov 1948, *Araque M. & Barkley 18M011* (US); Villavicencio, Nov 1938, *Cuatrecasas 4540* (F, COL, US); Llanos de San Martín, Jun 1916, *Dawe 279* (K); Río Guayariba Valley, 15 km w of Villavicencio, on road to Acacias, *Grant 9942* (US); San Juan de Arama, nacimiento del caño ''El Mico,'' Aug 1950, *Idrobo 494* (COL, US); Sabanas de San Juan de Arama, margen izquierda del Río Güejar, alrededores del aterrizaje ''Los Micos,'' Dec 1950, *Idrobo & Schultes 593* (COL, US); Cordillera La Macarena, trocha entre el Río Güejar y el caño Guapayita, Caño Yerli, Dec 1950, *Idrobo & Schultes 741* (COL, US); Cordillera La Macarena (extremo nordeste), macizo Renjifo, cumbre y alrededores, Jan 1951, *Idrobo & Schultes 1031* (COL, US); Llanos orientales, alrededores de Villavicencio, ca. del caño Quenane, Jul 1946, *Jaramillo, Mesa, Idrobo & Fernandez 318* (COL), *321* (COL, US); Acacias, Aug 1946, *Jaramillo, Mesa, Idrobo & Fernandez 420* (COL, US); ca. 20 km. SE of Villavicencio, Mar 1939, *Killip 34258* (COL, F, US); Villavicencio, Feb 1948, *Landeman 5794* (K); Villavicencio, Sep 1917, *Pennell 1599* (NY, US); ''Buenavista'' (Villavicencio), Jan 1930, *Arbeláez 31* (COL); Sierra de la Macarena, Río Guapaya, Nov 1949, *Philipson, Idrobo & Fernandez 1583* (US); hill back of Molina Tres Esquinos, Villavicencio, Jul 1945, *Schiefer 792* (COL, G, US); Caño Tiranas, Cordillera La Macarena (extremo nordeste), macizo Renjifo, cumbre y alrededores, Mar 1951, *Schultes 12130* (US); Villavicencio, Jan 1899, *Sprague 121* (F, K, US); Llano de San Martín, *Triana s. n.* (BM); Acacias, margenes del Río Acacitas, Apr 1950, *Uribe U. 2088* (COL); Acacias, en lugares inundadas, Apr 1950, *Uribe U. 2089* (COL). Norte de Santander: región del Sarare, Hoya del Río Cubugón, El Indio, Nov 1941, *Cuatrecasas 13097* (US); Salazar, Ocaña to Pamplona, Dec 1878, *Kalbreyer 832* (K). Putumayo: along Río Putumayo en Puerto Ospina, Nov 1940, *Cuatrecasas 10861* (COL, F, US); along Río San Miguel, margenes del río entre los afluentes Bermeja y Conejo, Dec 1940, *Cuatrecasas 11055* (COL, US); between Mocoa and Urcusique, near Quebrada Obandoyaco, Jan 1945, *Ewan 16791* (US); Umbria, 0°54′ N, 76°10′ W, Oct–Nov 1930, *Klug 1663* (BM, F, G, MICH, MO, NY, S, US); Mocoa and vicinity, Mar 1953, *Schultes & Cabrera 19044* (US). Vaupés: Caño Grande (selva entre Calamar y San José de Guaviare), Nov 1939, *Cuatrecasas 7369-A* (COL); riberas del Río Inírida (long. 69°45′ W) sitio ''Raudal Alto'' o Mariapiri, Cerro del Varador, Feb 1953, *Fernandez 2091* (COL, US); Río Taraira, at first rapids upstream, Jul 1948, *Schultes & Lopez 10217* (US); Río Kananarí, Cachivera Palito, Jul 1951, *Schultes & Cabrera 13107* (US); Río Vaupés, Mitú y alrededores, Sep 1957, *Schultes & Cabrera 13975* (NY, US); Río Piraparaná (trib. of Río Apaporis), between lat. 0°15′S, long. 70°30′W and lat. 0°25′N, long. 70°30′W, Caño Teemeeña, Sep 1952, *Schultes & Cabrera 17452* (US); Río Vaupés between Mitú and Javareté, mouth of Kerari, Mai 1953, *Schultes & Cabrera 19340*

(US); Río Paca (trib. of Río Papurí), Wacaricuara and vicinity, ca. lat. 0°30′N, long. 70°10′W, Jun 1953, *Schultes & Cabrera 19523* (US). Vichada: San José de Ocuné, Río Vichada, Jan 1944, *Hermann 11052* (COL).

ECUADOR: Santiago-Zamora (''Oriente''): near Méndez, uplands along Río Upano just n of junction with Río Chupiantza, Nov 1944, *Camp 1005* (NY).

PERU: Loreto: Santa Rosa, lower Río Huallaga below Yurimaguas, Sep 1929, *Killip & Smith 28775* (NY, US); Balsapuerto, Apr 1933, *Klug 2981* (BM, F, G, MO, NY, S, US); Pébas on the Amazon R., Jul 1929, *Williams 1706* (F).

TRINIDAD: *Anderson s.n.* (G); Ortinola Estate, Mar 1920, *Britton & Hazen 237* (G, NY, US); Caura, Jan 1929, *Broadway 7082* (S, US); Aripo Road, 3¼ mile post, Mai 1927, *Broadway 7371* (F, G-DEL, MO, S); Aripo Rd., at bathing pool, Apr 1933, *Broadway 9189* (BM, G, MO); *Fendler 747* (BM, NY); Mrs. Proctor's estate at Macqueripe ca. Port-of-Spain, Aug 1939, *Friend 142* (NY); J. Maracas Falls, Jun 1903, *Johnston 30* (G, NY); Apr 1874, *Kuntze 608* (NY); sides of rivers, *Lockhart s.n.* (K); near Four Roads, Mai 1924, *Riley 216* (C, K, NY); *de Schack s.n.* (K).

VENEZUELA: *Maraval 777* (28/1191) (C); Eleanor Creek, lower Orinoco, Mai, *Rusby & Squires 115* (BM, F, G, M, MO, NY, US). Amazonas: Salto Salas, alto Orinoco, Aug 1951, *Croizat 459* (NY); Radual Monserrat, alto Orinoco, Sep 1951, *Croizat 697* (NY); Jacare, Río Cunucunuma, Jun 1950, *Curran 226b* (NY); Cerro Yapacana, alto Orinoco, Apr 1931, *Holt & Blake 724* (US); Intermediate Camp, Cerro Sipapo, Feb 1949, *Maguire & Politi 28751* (NY); along Base R. (Caño Negro), at se base of Cerro Duida, Aug 1944, *Steyermark 57926* (F, NY); Foothills Camp, slopes of Mount Duida, Nov 1928, *Tate 390* (NY, US). Barinas: Carretera Sta. Bárbara de Barinas–Cd. Bolivia (Pedraza), Feb 1953, *Aristeguieta 1601* (NY, VEN). Bolívar: woods 1–10 km nw of Upata, on road to San Felix, between Upata & Altagracia, Jul 1944, *Steyermark 57669* (F, NY, VEN); at base of Cerro Negro Peron, range on right bank of Río Parguaza just below El Carmen, Dec 1955, *Wurdack & Monachino 40986* (NY). Delta Amacuro: Pto. Carijuto, Jun 1943, *Cardona 585* (VEN); along Río Acure 1–10 km above mouth, Apr 1955, *Wurdack 347* (NY). Mérida: along Río Onia, near Bolero, n of Mesa Bolívar, Mai 1944, *Steyermark 56711* (F, NY, S, VEN). Monagas: Caicara, Mai 1952, *F. Smith 236* (NY, US). Sucre: Cumaná, *Humboldt & Bonpland 397* (P). Trujillo: La Ceiba, along shore of Lake Maracaibo, Dec 1931, *Reed 916* (US): Zulia: Perijá, *Gines 1920* (US).

CULT.: Hort. Kew., 31 Jul 1878, labeled ''Anthurium Dechardi André.''

Vernacular names: Colombia (Vaupés): ''pee-ka-sa-la-ree'' (Gwanano); ''a-na-too-roo,'' ''tö-mee-ka-ma-re'' (Kubeo); ''pee-a-ro,'' ''ka-po'' (Tukano). Trinidad: ''Arum Lily.'' Venezuela: ''picatón'' (Delta Amacuro); ''saca frio'' (Mérida); ''vainilla'' (Monagas, Sucre).

This is a very distinct species, widely separated geographically from closely related species by the Andes and the Pacific Ocean. The original material sent to Kew in 1789 apparently was not a ''native of the West-India Islands,'' as stated in *Curtis's Botanical Magazine* (*pl. 603.* 1803). Not a single collection from any West Indian island is known, except from Trinidad, which is floristically related to continental South America rather than to the Antilles. It would therefore seem that the British colonials passed the plant from Trinidad to St. Vincent before it was sent to England.

In this genus *S. cannaefolium* is the most widely distributed species, but it varies remarkably little except in size, despite its wide range. In Trinidad the species reaches its maximum stature, and the leaves are proportionally broader (about twice to two and one-half times as long as wide). The specimens found near the Río Orinoco from Puerto Ayacucho to Cerro Duida are small; the smallest specimens seen were collected on the slopes of the sandstone tabletop mountains of Venezuela (in which the leaf-ratio varies to four times as long as wide).

This species differs from *S. commutatum* by its narrower leaves which are typically oblanceolate and widest above the middle. The spathe is commonly wider in this species than in *S. laeve.*

2. S. commutatum Schott, Oesterr. Bot. Wochenbl. **7**: 158. 1857. Figure 1.

Spathiphyllopsis minahassae Teijsm. & Binn. Natuurk. Tijdsch. Ned. Indie **25**: 400. 1863.
Massowia commutata Ender, Ind. Ar. 52. 1864.
Spathiphyllum minahassae (Teijsm. & Binn.) Regel, Gartenflora **19**: 1,2. *pl. 637*. 1870.
Spathiphyllum micronesicum Hatusima, Jour. Jap. Bot. **15**: 19. 1939.
Spathiphyllum funereum Tuyama, Jour. Jap. Bot. **16**: 194. 1940.

Plants often very robust. Leaf-blade somewhat oblique, typically broadly elliptic, uncommonly varying to elliptic-rotund or narrowly elliptic, 35–50(–85) cm long and (11–)14–24(–30) cm wide, widest just at the middle, rounded toward the apex and ending in an acuminate-cuspidate point 2–5 cm long, the base mostly obtuse or sometimes acute; petiole subequaling or a little longer than the blade, 30–45(–63) cm long, prominently alate to the base of the geniculum or less, the wing early deteriorating; geniculum 1.8–2.5(–5) cm long. Peduncle 1.5–2 times as long as the blade, (35–)50–75(–90) cm long; spathe reflexed, lanceolate or oblong-lanceolate to elliptic- ovate, rarely ovate-rotund, 14–24(–35) cm long and (3–)5.5–8(–14) cm wide, long-attenuate or acuminate, the base obtuse to subrotund or cordate (!), sometimes decurrent on the peduncle 0.4–2(–4) cm; spadix 5–9(–16) cm long, on a stipe 0.3–3(–5) cm long; perianth fleshy, formed into a round or 4–6-sided truncate cup nearly concealing the pistil and 5 or 6 stamens within; pistil cylindric-obpyramidal, the apex subtruncate varying to conic or occasionally attenuate or dome-shaped in age; ovary 3-locular, the ovules superposed, varying from 7–2 in each of the 3 locules, totaling 21–10(–6) ovules per ovary; fruiting spadix smooth, the fruit cylindric and rostrate, or the apex truncate and crowned by the persistent stigma; seeds nearly as many as the ovules, oblique-reniform or ovoid to comma- or horseshoe-shaped in profile, tan-colored, the surface quite smooth or sparsely foveolate.

Type collection: *H. Cuming s.n.*, "Philippines" (holotype BM). That collector visited Pacific islands and the East Indies between 1836 and 1839. It is unknown from which island of the Philippines this specimen came.

Distribution: northern Celebes (Manado), Ceram, Batjam, and Halmahera, in Indonesia, and on many of the Philippine Islands northward to Laguna province, Luzon.

INDONESIA: "Toeáre-Móa rug boren de S. Kóro: Manádo. o.a. Páloe," Aug 1937, *Eyma 1709* (BO); along footpath from Kakakasfen to top of Lokon, Jan 1895, *Koorders 492* (BO); Pakoe-oere, Apr 1895, *Koorders 3543* (BO), *3545* (BO); *Rachmat 559* (BO). Batjan: Sambaki, nw coast, Mai 1940, *Curran 364* (GH, US). Celebes: Manado, o.a. Paloe, to e of Lindoe-meer, from Kali Tôkararoe to the sea, w slope Goenoeng Ngilalaki, Jul 1939, *Bloembergen 4117* (BO); Northwestern Tetahi, o.a. Masamba, Aug 1937, *Eyma 1544* (BO); Oeloeánso, o.a. Malili, Aug 1938, *Eyma 3367* (BO); *Eyma 3548* (BO, L, U); Pinapoeang, G. Lolóa, G. Beábis, Sep 1938, *Eyma 3822* (BO); in forest near Lake Tondano, Jul 1860, *Forchez s.n.* (L); Gocroepohi, n Celebes, Mar 1917, *Kauderns 11* (L); Todjamboe, Jun 1929, *Kjellberg s.n.* (BO, S); Manado, afd. Donggala, Palu near Tomado, Nov 1930, *Posthumus 2480* (BO, L); *de Vriese & Teijsmann s.n.* (L); Manado, Tonsealama, Tanggari, Dec 1932, *Wisse 99* (BO). Ceram: Hoále pas-Hátoeméten, Dec 1937, *Eyma 2385* (BO). Halmahera: Loa Tobaroe, Mai 1922, *van der Brink 1983* (BO).

PHILIPPINES: Leyte: Mt. Abucayan, Feb 1923, *Edaño* (Bur. Sci.) *41835* (P, US); Dagami, Aug 1912, *Ramos* (Bur. Sci.) *15385* (BM, US); Jun 1913, *Wenzel 235* (G-DEL, MO). Luzon: Sarapan, Camarines Sur, Oct 1928, *Edaño* (Bur. Sci.) *76170* (NY); Lucban, Tayabas prov., Mai 1906, *Elmer 7540* (BO, G-DC, L); Paete, Laguna prov., ne of Sta. Cruz, 1894. *Langlassé s.n.* (G-BOIS); Umiray, Tayabas prov., Mai 915, *Loher 13599* (M); Lucban, Tayabas prov., Mai 1926, *McGregor 47379* (NY); Mayon Volcano, Albay prov., Mai-Jun 1953, *Mendoza 18160* (L); Sorsogon prov., Jul-Aug 1915, *Ramos* (Bur. Sci.) *23574* (P); Mt. Binuany, Tayabas prov., Mai 1917, *Ramos & Edaño* (Bur. Sci.) *28523* (BO); Paracale, Camarines prov., Nov-Dec 1918, *Ramos & Edaño* (Bur. Sci.) *33596* (L); Mt. Mayon, Albay prov., Sep 1908, *Robinson 6476* (L); Bo. Sn. Bartolome, Nagcarlon, Laguna prov., Apr 1929, *Sulit*

& Flores 31119 (NY). Mindanao: Todaya, Davao dist., Apr 1904, *Copeland 1263* (US); Zamboanga, Hiapan Mt., near Kabasalan, Nov 1940, *Ebalo 699* (G); Malangas, Zamboanga dist., Oct-Nov 1919, *Ramos & Edaño* (Bur. Sci) *36810* (US). Mindoro: Baco R., Apr-Mai 1905, *McGregor 189* (NY, US); Baco R., Mar 1905, *Merrill 4080* (NY, US); Mt. Halcon, Nov 1906, *Merrill 5486* (NY, US); Mt. Halcon, Mar 1922, *Ramos & Edaño* (Bur. Sci.) *40704* (BO).

CULT.: Jun 1922, *van der Brink 1217* (U); *H.B. 5270* (BO), *5299* (U); *Koorders 15898β* (BO), *16144β* (L), *16145β* (BO), *16148β* (BO, L); Conservatories, *Wilson 01561* (NY), etc.

Vernacular names: Indonesia: ''matoetoenak,'' ''toenak,'' ''toendak,'' ''tusschen,'' "kebareasoe," "gogotola." Philippines: "pusao" (Mindanao).

S. commutatum is separated from the other species of this genus by a wide stretch of Pacific Ocean, yet it is very closely allied to *S. cannaefolium* of South America and *S. laeve* of Cocos Island (Costa Rica). *S. commutatum* differs from those species by its broadly elliptic leaf-blade which is widest just at the middle, and its spathe that is somewhat decurrent on the peduncle. The isolation of *S. commutatum* from related American species must have occurred long ago.

In the northern range of this species are found plants of very great vigor and size, with the spathe subcordate at the base, and the rostrate pistils conspicuously exceeding the perianth. Pending further investigation, this form was not named.

3. S. laeve Engl. Bot. Jahrb. **37**: 120. 1905. Figure 1.

Leaf-blade oblique, oblong-elliptic, 35–41 cm long and 10.5–12.5 cm wide, the apex acuminate, the base acute, marginally undulate, primary lateral veins many, arising at an angle of 55–65°; petiole ca. 60 cm long, alate in the lower half; geniculum ca. 1.2 cm long. Peduncle 71–92 cm long; spathe oblong, 16–20 cm long and 2.7–3.8 cm wide, marginally undulate, attenuate-acuminate at the apex, the base acute and decurrent on the peduncle ca. 1 cm; spadix 8.4–10.2 cm long, on a stipe 1.4–1.8 cm long; perianth a membranous, 4–6-sided cup; pistil obpyramidal, the apex truncate, only the elevated stigma exceeding the perianth; ovary 3-locular, the ovules affixed upon a sub-basal pad in each locule, varying from 5–3 in each of the 3 locules, totaling 13–9 ovules per ovary; fruiting spadix smooth; fruit subcylindric or with a constriction near the center, the seeds located above the constriction; mature seeds only 1 per locule, reniform-rotund in profile, the surface slightly furrowed and foveolate, ± evenly verrucose.

Type collection: *H. Pittier 12370*, ''commune dans les bois, Vallée Gissler, Ile Cocos, Pacifique,'' Costa Rica, 18 Jun 1898 (holotype B, isotype US).

Distribution: Shady, cool, wet places on Cocos Island.

COCOS ISLAND (Costa Rica): Wafer and Chatham Valleys, common in shady and cool places, Jan 1902, *Pittier 16244* (GH, US); in densely shaded places on banks of streams near sea-level, 1905-1906, *Stewart 278* (GH, US).

S. laeve is endemic to Cocos Island (in the Pacific some 300 miles off the Costa Rican coast). Known from only three collections taken within eight years of each other, it has not been recollected since 1906! This species links the one American species with a cup-like perianth and the closely allied Indonesian-Philippine species. The presence of a single distinct species on Cocos Island sheds a dim light on the possible history of the dispersal of this genus. .

S. laeve is closely related to the other two species of sect. *Massowia*, but differs from them by its narrower spathe; it is further distinguished from *S. commutatum* by the placement of the ovules upon a sub-basal pad rather than being superposed.

It is noteworthy that Engler incorrectly identified *Pittier 16244* as *S. wendlandii* Schott.

Section 2. Spathiphyllum sect. **Amomophyllum** (Engl.) Engl. in DC. Monogr. Phan. **3**: 227. 1879. Figure 2F-H.

Spathe flattened, commonly reflexed and non-decurrent upon the peduncle; perianth segments separate, or conglutinate or connate below; pistil subcylindric to obpyramidal, apically subtruncate, scarcely exceeding the perianth. Often slender plants 2–5 dm or more tall.

Type species: *Spathiphyllum gardneri* Schott, Aroid. **1**: 2. *pl. 3A.* 1853.

Distribution: northern South America, Panama, and Costa Rica.

The sect. *Amomophyllum* previously embraced only four species. I have referred to it nineteen species, six transferred from other sections, and nine species newly described. This breakdown appears to be completely natural.

4. S. quindiuense Engl. Bot. Jahrb. **37**: 120. 1905. Figure 5.

Leaf-blade somewhat oblique, narrowly elliptic-oblong or lanceolate-oblong, widest at the middle and narrowed equally toward either end, 12–40 cm long and 2–5.2 cm wide, the apex attenuate, the base acute, with ca. 5 pairs of primary lateral veins arising at an angle of ca. 20–35°; petiole equaling or shorter than the blade, 8–25 cm long (or possibly more; absent in type specimen), alate nearly to the geniculum or less; geniculum ca. 1–1.8 cm long. Peduncle 16–50 cm long; spathe elongate-lanceolate to narrowly oblong-elliptic, (4–)7.5–16 cm long and 1–3 cm wide, the apex attenuate, the base acute, somewhat clasping or decurrent to 1 cm, white within, green outside (at least in age); spadix 2–7 cm long, on a stipe 0.5–2 cm long; perianth of separate segments; pistil obpyramidal, angular, apically truncate, slightly constricted between the annular style and the ovary, only the coronate stigma exceeding the perianth, ovary 3-locular, the ovules superposed or ± collateral and affixed near the base of the locules, varying from 5–2 in each of the 3 locules, totaling 14–6 ovules per ovary; fruiting spadix smooth; fruit subglobose, ca. 3 mm high, apically truncate; seeds fewer than the ovules, oblique-ovoid, the surface slightly roughened or verruculose, somewhat furrowed and foveolate.

Type collection: *J. J. Triana 693,* "Quindío, 1000 m.," Tolima, Colombia (holotype BM).

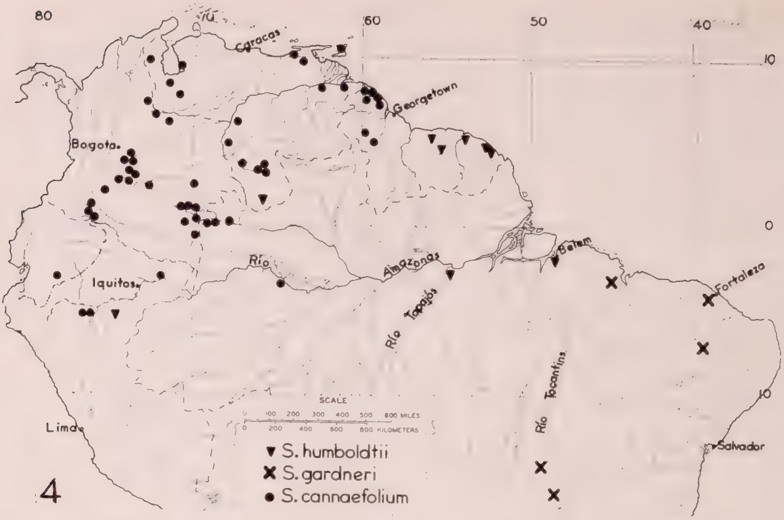
Distribution: Along rivers in the Magdalena Valley of Colombia, and in adjacent Panama.

PANAMA: along Charare R. above Chepo, prov. Panamá, Oct 1911, *Pittier 4724* (US); western slope and summit of Cerro Valle Chiquito, prov. Coclé, Jul 1935, *Seibert 507* (F, GH, MO, NY).

COLOMBIA: 12 leguas se de Barranca Bermeja, de la margen dereche del Río Opon, Santander, Sep 1954, *Castañeda 4860* (COL, US); Río San Pedro, Nariño, Antioquia, Dec 1891, *Lehmann 7590* (F, GH, S, U, US).

Until the present, *S. quindiuense* was known from the type only. Several other collections from Colombia and Panama have been referred to this species. Before examination of the type specimen (*Triana 693*), it had been concluded that a distinct taxon existed in that region, represented especially by *Seibert 507* and *Lehmann 7590.* Only much later did I have the opportunity to study the type specimen of *S. quindiuense;* although I have been unable to actually compare it side by side with the other specimens, all appear to be conspecific.

Specimens referred here vary considerably in size, yet all have similar proportions. The distinguishing features of *S. quindiuense* are the narrow leaf and spathe of coarse texture, and typically the 5–4 ovules per locule. *Lehmann 7590* and *Pittier 4724* possess only 3–2 ovules per locule, but in all other characteristics


4
80
60
50
40
10
0
10
Caracas
Georgetown
Bogota
Iquitos
Lima
Río
Amazonas
Belem
Fortaleza
Río Tapajós
Río Tocantins
Salvador
SCALE
100 200 300 400 500 600 MILES
0 200 400 600 800 KILOMETERS
▼ S. humboldtii
✕ S. gardneri
● S. cannaefolium

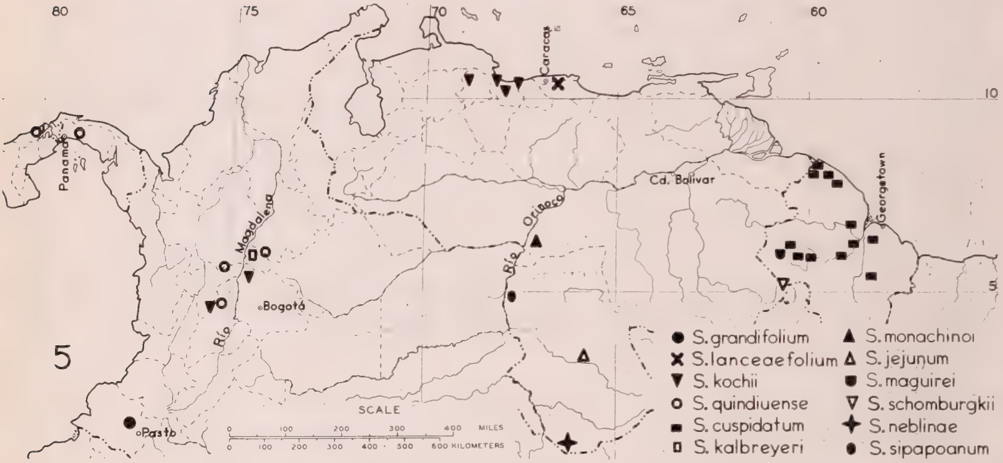

5
80
75
70
65
60
10
5
Caracas
Panama
Magdalena
Río
Bogotá
Pasto
Río Orinoco
Cd. Bolivar
Georgetown
SCALE
0 100 200 300 400 MILES
0 100 200 300 400 500 600 KILOMETERS
● S. grandifolium
✕ S. lanceaefolium
▼ S. kochii
○ S. quindiuense
■ S. cuspidatum
□ S. kalbreyeri
▲ S. monachinoi
△ S. jejunum
■ S. maguirei
▽ S. schomburgkii
✦ S. neblinae
● S. sipapoanum

FIG. 4. Geographic distribution of three species of *Spathiphyllum* widespread in northern South America. FIG. 5. Geographic distribution of nine species of sect. *Amomophyllum* and three species of sect. *Spathiphyllum* of northern South America and Panama.

they are typical. Most nearly identical to the type is *Seibert 507*, which has served to guide me in the amplification of this species.

The Peruvian species *S. lechlerianum* is probably the closest ally of this species. From it *S. quindiuense* is separated by its proportionally narrower spathe.

S. quindiuense is considered primitive among the species of section *Amomophyllum,* and indeed may have arisen from stock similar to that which gave rise to *S. friedrichsthalii* of sect. *Spathiphyllum.* Both species tend toward a multiovulate condition of the ovary, and both grow in the Panama-Colombia area where the greatest concentration of species of *Spathiphyllum* occurs.

5. S. monachinoi Bunting, sp. nov. Figure 5.

Foliorum lamina valde anguste oblonga ad lanceolato-ellipticam, 30–34 cm longa et 3.5–4.3 cm lata, ad apicem acuminata, ad basim acuta, venis primariis 5-jugatis angulo 15–20° divergentibus; petiolus gracilis, 27–32 cm longus, ad dimidium conspicue vaginatus; geniculum ca. 1.7 cm longum. Pedunculus petiolum longitudine subaequans, ca. 30 cm longus; spatha anguste lanceolata, 11.8 cm longa et 2.6 cm lata, apice attenuato, basi acuto et in pedunculo ca. 0.5 cm decurrenti, intra viridi-alba, extus viridis (fide Wurdack et Monachino); spadix albus, ca. 4 cm longus, stipite ca. 2 cm longo; perianthii segmenta separata; pistillum obpyramidale, apice subtruncato, solum stigmate papilliformi perianthium superanti; ovarium 2-loculare, loculis 6–5-ovulatis, ovulis ad pulvinum subbasilarem in loculo quoque affixis, 12–11 in toto ovario; fructus ignotus.

Type collection: *J. J. Wurdack & J. V. Monachino 41056*, "Spathe greenish-white above, green beneath, spadix white, in rocky moist ravine just below Raudal Maraca (ca. 110 river km from mouth), alt. 115 m," Rio Parguaza, Edo. Bolivar, Venezuela; 31 Dec 1955 (holotype NY). Unicate. Known only from the type collection. The collectors told me that they encountered numerous sterile plants in the locality, but only one flowering plant was found and collected.

It is with much pleasure that this species is named for Mr. J. V. Monachino, one of the collectors of the type specimen and Associate Custodian of the herbarium of the New York Botanical Garden. His keen taxonomic ability and willing assistance has greatly benefited the author during the course of this investigation.

S. monachinoi is the most robust Guayana species of sect. *Massowia*. Its bilocular ovary contains twelve or eleven ovules per ovary, in contrast to the trilocular ovary of *S. jejunum* which contains a total of only seven to six ovules. *S. monachinoi* was collected in lower elevations along the Río Parguaza, some 200 air miles north of the Río Cunucunuma where *S. jejunum* was collected. Between these points lies the broad Río Ventuari drainage, which Maguire and his associates have explored botanically without procuring a single specimen of *Spathiphyllum*.

The greater number of ovules per locule in *S. monachinoi* easily sets it apart from *S. sipapoanum* from nearby Cerro Sipapo. It differs from the other species of Guayana by its outstandingly larger size and narrower leaves.

There are similarities between this species and *S. quindiuense*. They differ in these characteristics: (1) the texture of the leaf-blade and spathe (in dried specimens) is chartaceous in *S. monachinoi*, pergameneous in *S. quindiuense;* and (2) the stipe of the spadix is proportionally shorter in the latter species.

6. S. gardneri Schott, Aroid. **1**: 2. *pl. 3A*. 1853. Figure 4.

Leaf-blade oblanceolate to oblong-elliptic, (10–)14–34 cm long, and 3–7.5 cm wide, the apex acute-acuminate, the base acute or subattenuate, with ca. 4–6 pairs of arcuate primary lateral veins arising at an angle of ca. 45°; petiole 15–35 cm long, alate in the lower half or more; geniculum 0.8–2.4 cm long. Peduncle exceeding the petiole, 21–45 cm long; spathe cucullate, lanceolate or elliptic, 7–10 cm long and 2.2–3.4 cm wide, the apex long-acuminate, the base acute to subtruncate, conspicuously oblique and decurrent on the peduncle to ca. 1 cm, white with a green central rib (fide Gardner); spadix 2.3–5.3 cm long, on a stipe ca. 0.5(–1.2) cm long; perianth segments separate above, sometimes conglutinate below, at least in age; pistil obpyramidal, scarcely exceeding the

perianth, apically conic-subtruncate, constricted between the annular style and the ovary, the stigma coronate; ovary 3-locular, the ovules superposed, varying from 6–3 in each of the 3 locules; totaling 15–11 ovules per ovary; fruiting spadix somewhat tuberculate; fruit obovoid, rostellate; seeds as many as the ovules, ± oblong in profile and very angular, the inner faces smooth, the outer face smooth or somewhat verruculose along the angles.

Type collection: *G. Gardner 1867,* "about 2 feet high, banks of the river near Crato; spathe white with a green central rib," Ceará, Brazil; Nov 1838 (lectotype K, isotypes BM, G-BOIS, G-DC, G-DEL, S, US).

Distribution: River banks in the forests of Maranhão and Goias, Brazil.

BRAZIL Ceará: *Gardner 1868* (P); Serra do Araripe, Procendencia do Granjeiro, Sep 1933, *Luetzelburg 25842* (M). Goias: region of southern Serra Dourada at long. 48°50′W. lat. 13°45′ S, forest along road 13 km east of Formosa, Mai 1956, *Dawson 15135* (LAM). Maranhão: *Don 2* (BR).

This is the southernmost species of *Spathiphyllum* in eastern South America. For nearly a century *S. gardneri* was known from the type collection only. I am the first to assign *Don 2* to this species. Though Lanjouw included G. Don among the West Indian collectors only, there can be little question that the specimen in the Martius Herbarium that bears his name was collected in Brazil and represents *S. gardneri.* The original set of Don's collections is at Edinburgh; unfortunately, I have not seen that material.

Two modern collections are identified as *S. gardneri.* Although *Luetzelburg 25842* was collected in the type locality, the leaves are very small in comparison to those of other specimens of this species. Nearly identical to the type material is *Dawson 15135,* collected in the province of Goias.

Schott originally described the sepals of *S. gardneri* as connate; Engler described the perianth as 6-lobed apically with the segments connate below, which is essentially accurate. Such a criterion, however, is no good reason for their placing this species in sect. *Massowia* with those species which have a cup-like perianth. *S. gardneri* appears to be closely allied to *S. cuspidatum,* and is included in sect. *Amomophyllum.* From the latter species, *S. gardneri* differs in its shorter spadix which is nearly sessile, and in the ovules which are superposed and affixed well up in the locules.

7. S. cuspidatum Schott, Oesterr. Bot. Wochenbl. **7**: 158. 1857. Figure 5.

Leaf-blade lanceolate to oblong-elliptic, 24–38(–51) cm long and 5–10(–13) cm wide, the apex acuminate, the base acute, with ca. 9 pairs of primary lateral veins arising at an angle of 35–45°; petiole somewhat longer than the blade, (11–)25–45(–66) cm long, conspicuously alate in the lower two-thirds; geniculum 1.2–2(–3) cm long. Peduncle ca. 2–2.5 times as long as the blade, 35–70 (–100) cm long; spathe lanceolate to elliptic, 10–20(–26) cm long and 3–6 cm wide, the apex acuminate to subcaudate, the base acute or narrowed into a short handle; spadix 4–9(–13) cm long, on a stipe 1–2.5(–3.8) cm long; perianth of separate segments; pistil obpyramidal, apically truncate, slightly constricted between the ± annular style and the ovary, only the nipple-like stigma exceeding the perianth; ovary 3-locular, the ovules affixed near the base of the locules, varying from 4–2 in each of the 3 locules, totaling 12–6 ovules per ovary; fruiting spadix smooth; fruit obovoid, apically truncate; seeds as many as the ovules, oblique-oblong-ovate in profile, the surface quite smooth or shallowly furrowed and foveolate.

Type collection: *C. C. Parker s.n.*, "Demerara," British Guiana (lectotype K). Apparently a unicate, collected in 1824. A Splitgerber collection from Suriname was also cited by Schott in the original publication of this species, but it has not been seen, or even located.

Distribution: Swampy forested areas of British Guiana.

BRITISH GUIANA: Mazaruni R., *Appun 230* (K); *Appun 848* (K); Smote Creek, Waini R., Jul 1906, *Beckett & Kortright 8487* (K); Kaow Creek, Mazaruni Station, Jul 1939, B. G. For. Dept. 2976 (K); Potare, Mahdia R., Jan 1943, B. G. For. Dept. 3904 (K), 3909 (K); in swamp, Huradaiah, Moruka R., Pomeroon Dist., Aug 1921, *de la Cruz 1026* (GH, NY, US); Pomeroon R., Pomeroon Dist., Jan 1923, *de la Cruz 2940* (F, GH, MO, NY, US); Pomeroon R., Dec 1922, *de la Cruz 3128* (F, GH, US); Waini R., Northwest Dist., 8°20′ N, 59°40′ W, Apr 1923, *de la Cruz 3610* (F, GH, MO, NY, US); along creek, Kartabo Station, junction of Mazaruni R. & Cuyuni R., Jul 1924, *Graham 310* (NY); swamp in forest by Kawow Creek, Penal Settlement, Dec 1919, *Hitchcock 17235* (GH, NY, S, US); *Hooker s.n.* (NY); Pomeroon R., Mar 1884, *Jenman 1985* (K); Demerara R., Jan 1896, *Jenman 6868* (K); Barima R., Mar 1896, *Jenman 6989* (K); Kamakusa, Nov 1922, *Leng 49* (NY); Kamakusa, Dec 1922, *Leng 353* (NY); wet places, Comaka, Demerara R., Mai 1923, *Persaud 269* (F); in mora swamp, Moraballi Creek, near Bartica, Essequibo R., Aug 1929, *Sandwith 153* (K).

Engler and Krause (Pflanzenreich **4**^{23B}: 128. 1908) cited *Jenman 6989* as *S. cuspidatum*, but incorrectly stated its locality as "Roraima." It is a mixed collection from along the Barima River; the New York sheet represents *S. cannaefolium*, the two Kew sheets *S. cuspidatum*. Engler described the locules of the ovary of this species as biovulate; my observations are that there are 4–2 ovules per locule.

S. cuspidatum appears to be limited to British Guiana. However, Jonker & Jonker (Fl. Suriname **1**: 28, 29. 1953) included this species in their treatment on the basis of a Splitgerber collection from Sarumassa, cited by Schott (Prodr. Syst. Aroid. 428. 1860). Although no subsequent investigator appears to have seen that specimen, it is possible that *S. cuspidatum* occurs in Suriname.

S. cuspidatum may represent a terminal element in phylogenetic development in this genus. It varies very little, and is common within narrow geographical limits. It is most similar to *S. kalbreyeri*, from which it differs in its lanceolate or elliptic spathe which is somewhat broader than in the latter species. There is also a tendency toward a slightly greater number of ovules per ovary than is found in *S. kalbreyeri*.

Of considerable interest is the possible relationship between *S. cuspidatum* and *S. humboldtii*, which latter species exhibits such diverse ovary characteristics as to be placed in a separate section. It is a reasonable conjecture that these two species, as well as *S. gardneri*, may have arisen from a common primal stock.

8. S. kalbreyeri Bunting, sp. nov. Figure 5.

Foliorum lamina e oblongo- ad lanceolato-ellipticam, 33–40 cm longa et 9–10.5 cm lata, ad apicem acuminato-cuspidata, ad basim acuta; venis primariis multis angulo 35–45° divergentibus; petiolus 32–43 cm longa, ad ⅓ vel plus vaginatus; geniculum ca. 2 cm longum. Pedunculus 40–58 cm longus; spatha oblonga, 13.5–15 cm longa et 2.5–3 cm lata, apice attenuato-acuminato, basi acuto et leviter complexo; spadix 7–8.5 cm longus, stipite ca. 1 cm longo; perianthii segmenta separata; pistillum obpyramidale, apice truncato, solum stigmate papilliformi perianthium superanti; ovarium 3-loculare, loculis 4–2(–1)-ovulatis, ovulis ad pulvinum subbasilarem in loculo quoque affixis, 9–5 in toto ovario; fructus ignotus.

Type collection: *Kalbreyer 1413,* "tufted habit, 2½–3′; leaf erect, thin; spathe 5–6″ l., green, nerved when old inside white; spadix bent greenish or yellowish; forest shady marshy spaces 3000′; Rastrojas," Colombia, 15 Feb 1880 (holotype K).

COLOMBIA: Sur de Santander: Amarilla Creek, vic. of Barranca Bermeja. Magdalena Valley between Sogamoso and Carare Rivers, Jul 1936, *Haught 1894* (US).

PANAMA: Darién: trial between Paya & Pucro, wet forested area, Jun 1959, *Stern, Chambers, Dwyer & Ebinger 404* (MO).

S. kalbreyeri is limited to the Magdalena Valley of Colombia and adjacent Darien, Panama. It is remarkably similar to *S. cuspidatum*, but is probably distinct. Each of these species has a very limited range, and is separated from the other by all Guayana and the Cordillera Oriental of the Andes. *S. kalbreyeri* is distinct in its oblong spathe which is proportionally somewhat narrower than in *S. cuspidatum*. There is a tendency toward a small reduction in the number of ovules per ovary in this species, and the blade of the leaf and the spathe are coarser in texture than in *S. cuspidatum*.

9. S. lechlerianum Schott, Prodr. Syst. Aroid. 425. 1860. Figure 6.

Leaf-blade oblique, narrowly lanceolate-elliptic to oblong-elliptic, 16–25 cm long and 2.5–4 cm wide, the apex attenuate-acuminate, the base attenuate or acute, the 5 or 6 pairs of primary lateral veins arising at an angle of 25–30°; petiole 15–25 cm long, prominently alate in the basal two-thirds or nearly to the geniculum in reduced floral leaves; geniculum 1.3–1.8 cm long. Peduncle 27–42 cm long; spathe cucullate, broadly lanceolate, 7–12 cm long and 2.2–3 cm wide, the apex acuminate to subcaudate, the base subacute and decurrent on the peduncle to 1.4 cm (!), white within, medium green outside (fide Spruce); spadix 2–3.7 cm long, on a stipe 0.5–1 cm long; perianth segments separate or possibly conglutinate below in age; pistil obpyramidal, apically truncate, the elevated stigma scarcely exceeding the perianth; ovary 3-locular, the ovules superposed, varying from 5 to 3 in each of the 3 locules, totaling 14–10 ovules per ovary; fruit unknown.

Type collection: *W. Lechler 2338,* "St. Gavan in umbros," Peru, Jul 1854 (holotype K). According to Weberbauer (El Mundo Vegetal de los Andes Peruanos 14. 1945) this locality is San Gaban, in "el Oriente andino de la provincia de Carabaya," which is northwest of Lake Titicaca and east or southeast of Cuzco.

Distribution: Wooded slopes in southeastern and northeastern Peru, and the Magdalena Valley of Colombia (possibly).

PERU: prope Tarapoto, Feb 1856, *Spruce 4496* (BR, K).

COLOMBIA: Sur de Santander: camp on Margarita Creek, vic, of Barranca Bermeja, Magdalena Valley, between Sogamoso R. & Colorado R., Sep 1934, *Haught 1367* (US).

CULT. (probably): *Davis 152,* "Hort. Veitch, Aug 1876, teste N. E. Brown," and on same sheet an individual element labeled "with the Peruvian plants of Mr. Davis, coll. Mess. Veitch," Jul 1884 (K).

This species extends almost to 14° S latitude. Specimens collected in widely disjunct localities have been identified as *S. lechlerianum*. The Colombian collection (*Haught 1367*) must be referred to this species, despite the great distance between its collection locality and that of other specimens. However, it was not considered in the preparation of the description of *S. lechlerianum*.

The original description of *S. lechlerianum* gives no details of the ovary, but Schott placed this species in a group which he characterized as having the sepals connate in a truncate cup! Engler retained this species in sect. *Massowia,* but emended the description of that group to account for the six-lobed nature of the apex of the perianth found in this species. N. E. Brown later annotated the type sheet "Perianth segments all free to the base." I made careful examination of this structure in the type specimen and in *Davis 152*, and concluded that the perianth segments are free from one another. It appears that the segments may be conglutinate in age as in many other species.

S. lechlerianum is closely allied to *S. quindiuense,* and is here included in sect. *Amomophyllum.* Though the locules of the ovary are characteristically 5–4-ovulate in both these species, the leaf-blade of *S. lechlerianum* is proportionally narrower and its lanceolate spathe is proportionally wider and of more delicate texture than that of *S. quindiuense.* From *S. jejunum* this species differs in the greater number of ovules per locule.

10. S. jejunum Bunting, sp. nov. Figure 5.

Foliorum lamina obliqua, anguste oblongo-elliptica, 18–20 cm longa et 2–2.5 cm lata, ad apicem attenuata, ad basim acuta, venis primariis 4–5-jugatis angulo 15–20° divergentibus; petiolus 10–14 cm longus, ad ⅔ vaginatus; geniculum ca. 0.6 cm longum. Pedunculus 16 cm longus; spatha angustissime elliptica, 5.8 cm longa et 1 cm lata, apice attenuato, basi acuto, albo (fide Curran); spadix 1.6 cm longus, stipite ca. 1 cm longo; perianthii segmenta separata; pistillum cylindrico-obpyramidale, apice obtuso-subtruncato, solum stigmate elato perianthum superanti; ovarium ut videtur 2-loculare, loculis 3–2-ovulatis, 7–6 in toto ovario; fructus ignotus.

Type collection: *H. M. Curran 226a,* "found growing on rock along river banks, white flowers, Jacare, Río Cunucunuma," Terr. Amazonas, Venezuela, "4. 6. 1950" (holotype NY). Unicate, presumably. Known only from the type collection.

The two plants that represent *S. jejunum* were found mixed in a collection of *S. cannaefolium.* This is the only collection representing sect. *Amomophyllum* from the region near Cerro Duida. It is likely that they were collected at a low elevation, though the altitude was not stated on the label. *S. jejunum* is related to *S. monachinoi,* but differs in its much smaller size (which suggested the specific epithet), and the 2–3-ovulate locules of the ovary are very different from the multiovulate locules of *S. monachinoi.* The proportionally narrower leaf-blade and spathe and the shorter geniculum serve to differentiate this species from *S. sipapoanum.* From *S. maguirei, S. jejunum* can be separated by its narrower leaf-blade and its apparently persistent spathe.

11. S. maguirei Bunting, sp. nov. Figure 5.

Foliorum lamina lanceolata, 13–15 cm longa et 2.3–3 cm lata, ad apicem attenuato-acuminata, ad básim acuta, venis primariis ca. 4–jugatis angulo ca. 25° divergentibus; petiolus 9.5–12 cm longus, ad ¾ vaginatus; geniculum 0.6–0.9 cm longum. Pedunculus ad 23 cm longus; spatha anguste lanceolata, ut videtur mature deciduo, 5.2–5.6 cm longa et 1 cm lata, apice attenuato, basi late acuto, viridis (fide Maguire); spadix 1.5–3.3 cm longus, stipite ca. 1 cm longo; perianthii segmenta separata vel ad basi conglutinata vel connata; pistillum obpyramidale, apice subtruncato, solum stigmate elato perianthium superanti;

ovarium 3-loculare, loculis 3–2-ovulatis, ovulis ad pulvinum subbasilarem in loculo quoque affixis, 7–6 in toto ovario; spadix fructiferus plus minusve levi; fructus angulari-sphaeroideus, latitudine longitudinem subaequanti, apice truncato; semina ovulos numero aequantia, obliquo-ovoidea, superficie foveolato.

Type collection: *B. Maguire & D. B. Fanshawe 32469,* "terrestrial, spathe green; spadix green; on rocks in stream, Moruka Creek, locally common, 1200 m alt., Kamarang River, Wenamu Trail," British Guiana, 9 Nov 1951 (holotype NY, isotype US). Known only from the type collection.

Though *S. maguirei* occurs in eastern Guayana, it seems as closely related to the western Venezuelan species (*S. neblinae* and *S. sipapoanum*) as to *S. schomburgkii* from nearby Mt. Roraima. The lanceolate leaf-blade of *S. maguirei* is distinctly different from the narrowly elliptic blade of *S. schomburgkii.*

S. maguirei finds its closest relative in *S. neblinae,* from which it is geographically separated by some 500 air miles. The spathe is often deciduous in these species and their floral characteristics are similar. *S. maguirei* differs by its proportionally narrower leaf-blade which is widest below the middle, and in the shorter stipe of the spadix.

No *Spathiphyllum* has been found in the intermediate area of great sandstone mountains of Bolívar to the west of Mt Roraima.

12. S. schomburgkii Schott, Oesterr. Bot. Wochenbl. **7**: 158. 1857. Figure 7.

S. candolleanum Schott var. *schomburgkii* (Schott) Engl. in DC. Monogr. Phan. 2: 225. 1879.

Leaf-blade oblique, narrowly elliptic, to 18 cm long and 2.5 cm wide, the apex acute-acuminate, the base attenuate, primary lateral veins ca. 4 pairs arising at an angle of 15–25°; petiole to 12.5 cm long, prominently alate nearly to the geniculum; geniculum ca. 0.8 cm long. Peduncle 26 cm long; spathe lanceolate-elliptic, 6.2 cm long and ca. 1.6 cm wide, the apex acute-acuminate, the base acute; spadix ca. 2.5 cm long, on a stipe ca. 0.7 cm long; perianth of separate segments; pistil obpyramidal, scarcely exceeding the perianth, the apex obtuse-subtruncate, the stigma coronate; ovary 2-locular(?), the ovules affixed on a sub-basal pad in each locule, (apparently) 4–3 in each of the locules, totaling 7–6 ovules per ovary; fruit unknown.

Type collection: *R. H. Schomburgk s.n.*, "1st Coll. M. Roraima," Venezuela (holotype K). Unicate(?). Probably found at lower elevations on slope of Mt. Roraima. Known only from the type collection.

S. schomburgkii stood for a long time as the only known species of this genus from a sandstone mountain of Guayana. Subsequent exploration of this region has yielded several collections of *Spathiphyllum.* All represent plants of small size. The pistil is nearly identical in all, viz., cylindrical-obpyramidal and scarcely exceeding the perianth, the apex obtuse-subtruncate, the stigma nipple-like or coronate. The pistil of *S. schomburgkii* was described initially as attenuate with a conical apex exceeding the sepals. On this basis (apparently), Engler made it a variety of *S. candolleanum.* Considerable attention to the nature of the pistil of this species has led me to conclude that it is unquestionably similar to that in other collections from sandstone areas of Guayana.

It is difficult to determine the number of taxa represented among the Guayana collections. In view of the small number of collections, I was reluctant to create new names that might later fall in the light of further collections. Nevertheless, it is felt that no collections are conspecific, and six species are described as new to science.

S. schomburgkii seems to be closely related to *S. sipapoanum* from which it differs by its narrowly elliptic leaf-blade, its perianth of five or six segments,[11] and the greater number of ovules per ovary. It is separated by its narrower leaves and the shorter stipe of the spadix from *S. neblinae*. Inflorescence characteristics serve to set apart *S. schomburgkii* from the Andean species.

13. S. neblinae Bunting, sp. nov. Figure 5.

Foliorum lamina elliptica vel rare lanceolato-elliptica, (10.5–)15–19 cm longa et (2.3–)2.9–3.9 cm lata, ad apicem acuminata, ad basim acuta, venis primariis 4–5-jugatis angulo 20–30° divergentibus; petiolus (4–)7.5–12 cm longus, ad dimidium vel plus vaginatus; geniculum 0.5–1.3 cm longum et supra sulcatum. Pedunculus (6–)18–25 cm longus; spatha recta, e oblonga ad lanceolatam, (4.4–)5.7–6.8 cm longa et (0.9–)1.3–2.4 cm lata, apice attenuato-acuminato, basi attenuato et aliquando breviter ansato, albo florescenti, in aetate viridescenti et ut videtur deciduo; spadix viridis, (1–)1.8–3.8 cm longus, stipite (1.2–)1.7–2.4 cm longo; perianthii segmenta separata; pistillum obpyramidale, apice truncato, leviter constrictum inter ovarium annulare et stylum, solum stigmate elato perianthium superanti; ovarium ut videtur 2-loculare, loculis 5–2-ovulatis, ovulis ad pulvinum subbasilarem in loculo quoque affixis, 9–5 in toto ovario; spadix fructiferus levis; fructus cylindrico-obpyramidalis; semina ovulos numero aequantia, valde angularia et irregulariter reniformia vel obliquo-ovoidea, superficie conspicue foveolato.

Type collection: *B. Maguire, J. J. Wurdack & G. S. Bunting 36797*, "spathe white in flr., green in frt., spadix green; geniculum grooved above; rainforest; streamside at Camp 2; locally frequent; elev. 180 m; lowland & slope forests, Cerro de la Neblina, Río Yatua"; Terr. Amazonas, Venezuela; 14 Dec 1953 (holotype NY, isotype US).

VENEZUELA: *Maguire et al. 36799*, same data as the type collection (NY).

S. neblinae is allied to the other species of Guayana (discussed under *S. schomburgkii*). Its closest relative is *S. maguirei*. Both share the peculiarity of a deciduous spathe, but from all other species of the sandstone area *S. neblinae* differs by its proportionately wider leaf-blade and the longer stipe of its spadix. It resembles *S. minor* of Amazonian Peru, but the latter differs in the shorter stipe of its spadix and the uniovulate condition of the locules of its ovary.

14. S. floribundum (Lind. et André) N. E. Br. Gard. Chron. II. **10**: 783. 1878. Figure 7.

Anthurium floribundum Lind. et André, Ill. Hortic. **21**: 24. *pl. 159.* 1874.
Amomophyllum floribundum (Lind. et André) Engler, Gard. Chron. II. **7**: 140. 1877.
Spathiphyllum floribundum var. *cuneatum* Engl. Bot. Jahrb. **6**: 281. 1885.

Leaf-blade conspicuously oblique, elliptic to oblong or oblanceolate, widest at or just above the middle, 13–20(–26) cm long and 5.5–9(–10.5) cm wide, the apex cuspidate, the base obtuse or acute, marginally undulate, dark green above with a velvety lustre, the primary lateral veins ca. 9 pairs arising at an angle of ca. 65–75°; petiole (6.5–)10–22(–28) cm long, often alate nearly to the geniculum, vaginate below or the wings expanded and free; geniculum 0.5–1.3 cm long. Peduncle (16–)20–37 cm long; spathe white, reflexed, lanceolate to oblong-elliptic, 4–8(–9.8) cm long and 1.2–3 cm wide, the apex attenuate to cuspidate, the base acute to subtruncate and clasping the peduncle; spadix 2.5–5.5 cm long, on a stipe 0.3–0.8 cm long; perianth green, the segments separate or sometimes conglutinate in age; pistil white, obpyramidal, apically truncate, the stigma elevated and shortly exceeding the perianth; ovary 3-locular, the ovules affixed at or near the base of the locules, varying from (3–)2 to 1 in each of the 3 locules, totaling (7–)6–4 ovules per ovary; fruiting spadix smooth; fruit spheroid, the apex truncate; seeds 1 or 2 per locule, the surface vertically furrowed and foveolate between the verrucose ridges.

---

[11] Not considered a good diagnostic feature.

Type: *pl. 159,* L'Illustration Horticole **21**: 24. 1874. This color plate adequately defines *S. floribundum,* and agrees with the original description which it accompanies. This species was described from a plant growing in cultivation, and no type material appears to have been prepared. A fine representative specimen of *S. floribundum* is *Lehmann 7758* (F, GH, US), which is more or less identical to the material cultivated today under this name.

Distribution: Banks of streams in the central Magdalena Valley of Colombia.

COLOMBIA: Boyaca: high forested fronts, El Humbo, 130 mi n of Bogotá, Mar 1933, *Lawrence 696* (MO). Cundinamarca: Paime, *Bro. Ariste-Joseph A924* (US). Sur de Santander: camp on Taza Creek, vicinity of Barranca Bermeja, Magdalena Valley between Sogamoso R. & Colorado R., Feb 1934, *Haught 1271* (US); camp on Margarita Creek, vicinity of Barranca Bermeja, Magdalena Valley between Sogamoso R. & Colorado R., Oct 1934, *Haught 1386* (F, US); brookside, Dosquebrados, Jan 1880, *Kalbreyer 1354* (K). Antioquia: Rostrojas, Feb 1880, *Kalbreyer 1414* (K); Sabaleta, *Lehmann 7757* (F); Río Nuz, 600–1000 m, *Lehmann 7758* (F, GH, US); "alt. 1200," *Triana 696* (BM).

CULT.: Hort. Williams, Aug 1876, and Hort. Kew, Mai 1876, *N. E. Brown s.n.* (K); Hort. Kew ex Hort. Williams, Apr 1878, and Hort. Veitch, Apr 1879, *N. E. Brown s.n.* (K); *Engler 82* (B, BM, C, G-BOIS, G-DEL, GH, L, M, P, US); Hort. Cantonspaark no. 3393, Dec 1953 (U); etc.

Perhaps the most handsome member of the genus, this species has been a popular conservatory subject for nearly a century. Though not described until 1874, *S. floribundum* was first collected by Gustav Wallis before 1864. The original description gave no data on its arrival in Europe, but stated only that it was prepared from a plant growing in the garden of M. Linden for the previous two years, and that its publication had been delayed by lack of sufficient flowers to determine in which genus it should be placed (they erroneously selected *Anthurium!*). In 1875 (Hamb. Gart. Blum. **31**: 63), Wallis listed *A. floribundum* among his collections near San Carlos (Aguas Claras), New Granada, mentioning that many of these same species were collected previously. It is likely that *S. floribundum* was first collected in that locality.

S. floribundum appears to be endemic to the Magdalena Valley of Colombia. Various authors have referred to this species collections from Panama, but I cannot corroborate their identifications. Vegetatively *Bailey 209* resembles this species, but a cursory inspection of the spadix clearly demonstrates the conic pistils; it is referred to *S. phryniifolium.* Standley (Ann. Missouri Bot. Gard. **31**: 34. 1944) cited this collection as *S. floribundum,* then illustrated the species with a drawing of *Seibert 507,* which I identify as *S. quindiuense.*

There seems little cause to maintain var. *cuneatum* of this species. It was based upon *Lehmann 2592,* collected in Tolima, Colombia. That specimen was deposited at Berlin, and was probably burned.

S. floribundum is outstanding for its dark green leaves with a velvety lustre. As a dried specimen, however, it differs in its broad leaves. It is most closely related to *S. fulvovirens* and *S. juninense,* both of which are species of much greater size than this species.

Some cultivated material of *S. floribundum* has the spathe cuspidate at the apex, in contrast to the long-attenuate apex of the spathe in all collections from the wild. This difference of the cultivated form may have resulted from selection by horticulturists.

15. S. fulvovirens Schott, Oesterr. Bot. Zeitschr. **8**: 179. 1858. Figure 7.

Leaf-blade oblique, typically ovate to ovate-elliptic, (25–)35–44 cm long and (10–)17–20 cm wide, the apex terminated by a cusp 1.5–3.5 cm long, the base obtuse to subrotund, the many primary lateral veins arising at an angle of 60–70° and very prominent beneath; petiole to 74 cm long, alate in the basal two-thirds; geniculum (1–)1.5–3 cm long. Peduncle to 49 cm or more long; spathe ± oblong and clasping at the base; spadix 6.8–11.5 cm long, smooth, on a short stipe 0.3–0.8 cm long; perianth of separate segments; pistil obpyramidal, apically truncate, the nipple-like stigma scarcely exceeding the perianth; ovary 3-locular, the ovules affixed near the base of the locules, 2 or 1 in each of the 3 locules, totaling 6–5 ovules per ovary; fruit unknown.

Type collection: *H. von Wedel 2198*, "shrub 3 ft., inflorescence gray, Fish Creek, vicinity of Chiriqui Lagoon," Prov. Bocas del Toro, Panama, 9 Apr 1941 (neotype GH, duplicates F, MO). The designation of a neotype is appropriate since neither the holotype (*Wendland 939*, "Pedregal, C. Rica, 1857") nor any duplicate of it has been located. A photograph of the holotype (Field Mus. no. 29838) clearly indicates that the type was deposited at Vienna, and therefore we must assume that it was burned along with the other Araceae.

Distribution: [Pedregal(?), Costa Rica], along Chiriqui Lagoon in northern Panama, in the central Magdalena Valley and Pacific coast of Colombia (Buenaventura).

COLOMBIA: Río Magdalena, *Weir 55* (BM). Santander: Amarilla Creek, vicinity of Barranca Bermaja, Magdalena Valley, between Sogamoso R. & Carare R., Jul 1936, *Haught 1895* (F, US). Valle del Cauca: Río Dagua, Buenaventura, *Lehmann 5361a* (F, K).

CULT.: "coll. Fl. Claes, Colombia, Juin 1927," *V. Lambert s. n.* (BR).

A good photograph of the holotype in conjunction with the original description of *S. fulvovirens* serves to define this species very well. It is further clarified by an original Schott drawing (W).

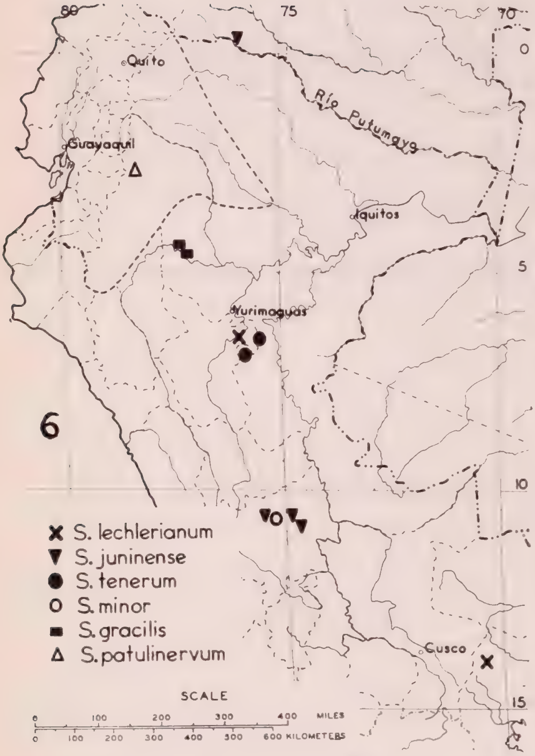
The exact collection locality of *Wendland 939* is uncertain. Standley (Field Mus. Publ. Bot. **18**: 48. 1937) noted that Wendland entered Costa Rica "by the Sarapiquí Valley, and explored especially the mountain chain from Barba to Turrialba," which would limit his localities to the provinces of Heredia and Cartago, on the Atlantic slope of the Cordillera.

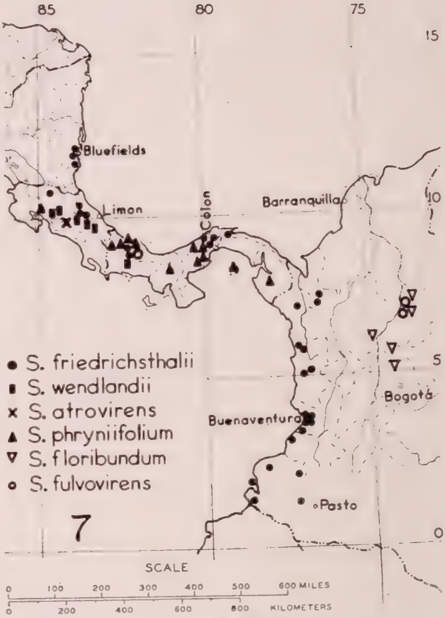
The Colombian collections referred to this species have a somewhat narrower leaf-blade than is typical, but they are essentially similar in other features.

S. fulvovirens finds its nearest relative in *S. juninense*, a Peruvian species with a wider spathe. These two might well be considered as infraspecific categories of a single species, but are maintained here as separate species because of the great distance between their areas of collection and the natural barrier to continuity of distribution created by the Cordillera Oriental of the Andes in Colombia.

16. S. juninense Krause, Notizbl. Bot. Gard. Berl. **11**: 615. 1932. Figure 6.

Leaf-blade oblique, ovate-elliptic, 28–32 cm long and 12–15.5 cm wide, the apex cuspidate (probably; lost from type specimen), the base rotund-obtuse, with many primary lateral veins arising at an angle of ca. 55–60°; petiole 40–57 cm long, alate throughout much of its length; geniculum 1.6–2 cm long. Peduncle to 70 cm long; spathe oblong, to 19 cm long and 5.7 cm wide, the apex long-cuspidate, the base apparently obtuse; spadix to 12.3 cm long, on a stipe ca. 1.5 cm long; perianth of separate segments; pistil obpyramidal, the apex subtruncate,


80
75
70
0
Quito
Guayaquil
Río Putumayo
Iquitos
5
Yurimaguas
6
10
Cusco
15
✖ S. lechlerianum
▼ S. juninense
● S. tenerum
○ S. minor
■ S. gracilis
△ S. patulinervum
SCALE
0 100 200 300 400 MILES
0 100 200 300 400 500 600 KILOMETERS


85
80
75
15
Bluefields
Limon
Colon
Barranquilla
10
5
Bogotá
Buenaventura
Pasto
0
7
● S. friedrichsthalii
■ S. wendlandii
× S. atrovirens
▲ S. phryniifolium
▽ S. floribundum
○ S. fulvovirens
SCALE
0 100 200 300 400 500 600 MILES
0 200 400 600 800 KILOMETERS

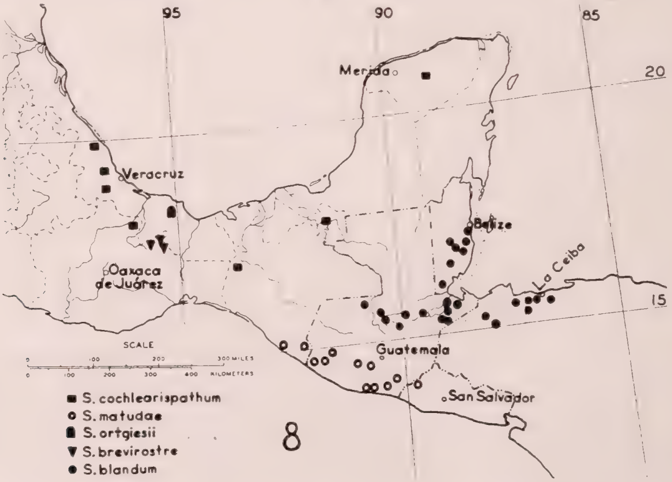

95
90
85
20
Merida
Veracruz
Oaxaca de Juárez
Belize
La Ceiba
15
Guatemala
San Salvador
SCALE
0 100 200 300 MILES
0 100 200 300 400 KILOMETERS
■ S. cochlearispathum
○ S. matudae
■ S. ortgiesii
▼ S. brevirostre
● S. blandum
8

FIG. 6. Geographic distribution of several species of *Spathiphyllum* sect. *Amomophyllum* of western South America. FIG. 7. Geographic distripution of two species of sect. *Amomophyllum* and four species of sect. *Spathiphyllum* of the Isthmus region and adjacent Colombia. FIG. 8. Geographic distribution of several species of sect. *Spathiphyllum* of Mexico and northern Central America.

crowned by the nipple-like stigma; ovary (2–)3-locular, the ovules affixed near the base of the locules, 2 or 1 in each of the 3 locules, totaling 5–3 ovules per ovary; fruit unknown.

Type collection: *E. P. Killip & A. C. Smith 26157,* "spathe white or green; Pichis Trail, Santa Rosa, alt. 625–900 meters, dense forest." Junín, Peru; 6, 7 Jul 1929 (holotype US, isotype B).

Distribution: Wet forests of Junín, Peru and along Río Putumayo, Colombia.

PERU: Junín: Puerto Bermudez, Jul 1929, *Killip & Smith 26565* (NY, US); Cahuapanas, on Río Pichis, Jul 1929, *Killip & Smith 26752* (NY, US).

COLOMBIA: Comisario del Putumayo: selva higrófila del Río Putumayo, Pto. Porvenir, arriba de Pto. Ospina hacia la Loma, Nov 1940, *Cuatrecasas 10665* (COL).

Though very similar to *S. fulvovirens,* it seems prudent to continue to recognize *S. juninense* as a distinct species until more adequate collections have accrued. The type collection is most distinctive (in this section of the genus) for its exceptionally wide spathe, and its stout spadix borne on an elongate stipe. Other Peruvian collections cited are somewhat anomalous, and were annotated "*S. juninense* vel aff." *Cuatrecasas 10665* was similarly annotated; its elliptic leaf-blade is acute at the base, and its spathe is narrower than that of the typical form. The small amount of material available precludes a knowledge of the natural variation of this species, yet these collections may represent a single taxon.

The Cordillera Oriental forms a geographic barrier in Colombia between *S. fulvovirens* and *S. juninense.* These two species are very similar, but the spathe is somewhat wider and there is a small reduction in the number of ovules per ovary in *S. juninense.* It is easily separated from *S. floribundum* by its much greater size.

17. S. patinii (Hogg) N. E. Brown, Gard. Chron. II. **10**: 783. 1878.

Anthurium patinii Hogg, Gard. Year-book 123. 1875.
Anthurium patini Mast. Gard. Chron. II. **3**: 524, 525. *f. 109.* 1875.
Anthurium candidum Bull, in Catalogue 3. *pl. iii.* 1875.
Amomophyllum patini (Mast.) Engl. Gard. Chron. II. **7**: 139. 1877.
Massowia gardneri C. Koch, Gard. Chron. II. **10**: 622. 1878; non Schott, Aroid **1**: 2. *pl. 3.* 1853.
Spathiphyllum candidum N. E. Br. Gard. Chron. II. **10**: 783. 1878.

Leaf-blade oblique, lanceolate-elliptic or oblong-elliptic, 12–21 cm long and 2.8–5 cm wide, the apex acuminate, the base acute-cuneate, marginally undulate, with ca. 4–6 pairs of primary lateral veins arising at an angle of ca. 45°; petiole slender, subequaling the blade, 10–22 cm long and alate in the lower two-thirds or more, vaginate below or the wings free and spreading; geniculum ca. 0.5–1(–1.5) cm long. Peduncle (10–)19–41 cm long; spathe reflexed, lanceolate to oblong, 4–8 cm long and 1–2.5 cm wide, the apex attenuate-acuminate, the base obtuse and clasping, white above, creamy-white beneath with the midrib green; spadix 1.3–3.6 cm long, on a stipe ca. 0.5(–1) cm long; perianth segments green, separate or sometimes conglutinate in age; pistil white, obpyramidal, apically truncate, only the nipple-like stigma exceeding the perianth; ovary 3-locular, the ovules affixed near the base of the locules, 2 in each of the 3 locules, totaling 6 ovules per ovary; fruiting spadix smooth; fruit angular-spheroid, apically truncate; seeds 1 or 2 per locule, ovoid, the surface verruculose, ridged and furrowed.

Type: the original description in Hogg's Gard. Yearbook [Int. Code Bot. Nomencl. (1956) Art. 10, note]. (The species is more adequately described and illustrated in Gard. Chron. II. **3**: 524–525. *f. 109.* 1875.) Known only in cultivation.

CULT.: Hort. Bull, 21 Nov 1878, *N. E. Brown* (holotype of *S. candidum* N. E. Br.), and Hort. W. Bull, 20 Apr 1879 (K); Hort. Kew, ex Hort. Williams, 16 Aug 1878 teste N. E. Brown (K); Hort. W. Bull, 7 Mai 1881, *N. E. Brown* with *Engler 229* (K); *Engler 229* (BM, G-DEL, US); "ex herb. J. Bauman" (S); 29-3-1939 (L); "In pots Bot. Gard. Singapore," Sep 1918, *C. X. Furtado* (BO, NY); etc.

Though unable to verify its priority, I have accepted the description in Hogg's *Year-book* as the first valid publication of the epithet *patinii,* thus following Engler's treatment (Pflanzenreich **4**^{23B}: 130, 131. 1908) and others since. Masters, in the same year, published a good illustration and description of this species, and stated that it had been introduced to Mr William's nursery from Colombia. Neither Hogg nor Masters made any mention of the other's publication.

The same species was described as new under the name *Anthurium candidum* by Mr W. Bull also in 1875. He attributed its introduction from Colombia to his own collector, Mr. Shuttleworth. Unfortunately, no specimen collected in Colombia by either Patin or Shuttleworth appears to have been preserved, and research has not revealed the exact locality where they first collected the species. André (Ill. Hortic. **27**: 135, 136. 1880) wrote that *S. patinii* was discovered in the province of Antioquia (New Granada) and was sent to Europe through the efforts of M. Patin in 1874.

A specimen preserved at Kew was taken "from the type plant" (fide N. E. Brown) at Hort. Williams. This specimen agrees perfectly with a much cultivated plant in American collections today. However, I have been unable to refer to this species any specimens collected from the wild, and thus the application of the name is here restricted to the material in cultivation which closely matches the initial description. Though suggestive of other Andean species, *S. patinii* is a distinct taxon. That this is a naturally occurring species is corroborated by a note accompanying Bull's description of *Anthurium candidum*. Bull's *Catalogue* (3. 1875), states that the plant was introduced to Mr. Bull by one "Mr. Shuttleworth, from the United States of Colombia" who described "the difficulties under which this remarkable plant was obtained, the climbing of a steep rock, owing to the rarified atmosphere being almost beyond his physical powers." One may conclude that *S. patinii* is a species of rugged, mountainous terrain. If so, the absence of collections from the wild is not surprising, in veiw of the near-total lack of modern collections of *Spathiphyllum* from Andean Colombia.

In 1878, N. E. Brown (Gard. Chron. II. **10**: 783) took up the name *S. candidum* for a plant which varied but slightly from the typical *S. patinii*. I have followed Engler and others in reducing *S. candidum* to synonymy under this species.

The leaf-blade of *S. patinii* is wider and has more spreading primary lateral veins than *S. quindiuense*. The close relationship of *S. patinii* to *S. tenerum* is clear, but the latter has wide-spreading primary lateral veins, its leaf-blade is proportionally broader, and the base of the blade is less acute or even obtuse.

18. S. sipapoanum Bunting, sp. nov. Figure 5.

Foliorum lamina anguste elliptico-oblonga, 16–17.5 cm longa et 2–2.3 cm lata, ad apicem acuminata, ad basim acuta, venis primariis 4–5-jugatis angulo ca. 25°; petiolus 10.5–12 cm longus, ad ⅔ vaginatus; geniculum 0.9–1.5 cm longum. Pedunculus quam petiolus ca. 2-plo longior, 21 cm longus; spatha lanceolata, 6.8–7.2 cm longa et ca. 1.8 cm lata, apice attenuato, basi acuto; spadix ca. 2 cm longus, stipite ca. 1.2 cm longo; flores 2-meri; perianthii segmenta separata; pistillum cylindrico-obpyramidale, quadrangulare, apice subtruncato, stigmate elato perianthium superanti, poro stigmatico oblongo; ovarium 2-loculare, loculis 2-ovulatis, 4 in toto ovario; spadix fructiferus levis; fructus cuboideus, breviter rostellatus; semina 4, ovoidea ad commaticiformia in faciei obliqua, superficie foveolato.

Type collection: *B. Maguire & L. Politi 28751b*, "streamside, mixed montane forest at 600 m alt., Intermediate Camp, Cerro Sipapo (Paraque)"; Terr. Amazonas, Venezuela. 2 Feb 1949 (holotype NY). Unicate. Known only from the type collection.

The original collection consists of two plants found mixed among specimens of *S. cannaefolium* (*Maguire 28751*) collected on the slopes of Cerro Sipapo, Venezuela. *S. sipapoanum* shows a close relationship to *S. schomburgkii*, but differs in its proportionally narrower, oblong leaf-blade, long-attenuate spathe, longer stipe, and bilocular ovary with two ovules per locule. The greater number of ovules per locule in *S. neblinae* separates it from *S. sipapoanum*.

19. S. tenerum Engl. Bot. Jahrb. **37**: 120. 1905. Figure 6.

Leaf-blade somewhat oblique, oblong-lanceolate, 16–18 cm long and 4–5 cm wide, the apex acuminate-cuspidate, the base commonly obtuse, with ca. 7 or 8 pairs of primary lateral veins arising at an angle of 60–65°; petiole slender, 20–26 cm long, prominently alate in the lower three-fourths; geniculum 0.4–0.6 cm long. Peduncle slender, 31–39 cm long; spathe oblong to oblong-lanceolate, 5.3–8.3 cm long and 1.5–2 cm wide, the apex attenuate to subcaudate, the base obtuse, greenish-white (fide Ule); spadix 2.6–5 cm long, on a stipe 0.3–0.8 cm long; perianth of separate segments; pistil obpyramidal, very angular, apically truncate, the nipple-like stigma shortly exceeding the perianth; ovary 3-locular, the ovules affixed near the base of each locule, 2(–1) in each of the 3 locules, totaling 6–4 ovules per ovary; fruiting spadix smooth; fruit broadly obovoid, apically truncate; seeds 5–3, broadly comma-shaped in profile, the surface vertically furrowed and foveolate between the verruculose ridges.

Type collection: *E. Ule 6851*, "Bodenpfl., Bl. grünlich weiss, Cerro de Ponasa, 1200 m," Loreto, Peru, Feb 1903 (holotype B, isotypes G-DEL, MG).

Distribution: Along streams in Loreto, Peru.

PERU: Loreto: Pongo de Cainarachi, Sep 1902, *Ule 6851b* (L).

The leaf-blade of *S. tenerum* is proportionally rather wide as compared to that of closely related species, and the primary lateral veins are quite widespreading, surpassed only by those of *S. patulinervum*. The exceptionally long and slender peduncles of *S. tenerum* are very characteristic. Close relationship exists between *S. tenerum* and *S. patinii*, but the base of the leaf-blade is broader in this species than in *S. patinii*.

20. S. minor Bunting, sp. nov. Figure 6.

Foliorum lamina obliqua, elliptico-lanceolata, 11–13.5 cm longa et 3 cm lata, ad apicem acuminata, ad basim cuneata vel acuta, veins primariis ca. 6-jugatis angulo ca. 45° divergentibus; petiolus ad 9.5 cm longus, alatus prope ad geniculum; geniculum 0.3–0.5 cm longum. Pedunculus quam petiolus 2-plo longior, ad 18 cm longus; spatha oblonga, 4–4.7 cm longa et 0.9–1 cm lata, apice acuminato, basi acuto et plus minusve complexa; spadix 1.7–2.5 cm longus, stipite

ca. 0.8 cm longo; perianthii segmenta separata; pistillum obpyramidale, apice truncato, stigmate papilliformi perianthium superanti; ovarium 3-loculare, loculis uniovulatis ovulo solitari prope basim loculi cuique affixo; fructus ignotus.

Type collection: *E. P. Killip & A. C. Smith 26153*, "Dept. Junín, Pichis Trail, Santa Rosa, alt. 625-900 meters; dense forest." Peru; 6, 7 Jul 1929 (holotype US, isotype NY). Known only from the type collection, which was originally referred to the genus *Stenospermatium* by Krause; it is clearly a *Spathiphyllum*.

While represented by a single collection of two plants, *S. minor* is distinctive and is described as new without reservation. It is low in stature, and has proportionally rather broad leaves as compared to the other species whose locules are uniovulate (*S. gracilis* and *S. patulinervum*). *S. minor* shows a strong relationship to the species of the sandstone areas of Guayana, especially to *S. neblinae*, but differs in the uniovulate condition of its locules.

21. S. gracilis Bunting, sp. nov. Figure 6

Foliorum lamina obliqua, anguste oblongo-elliptica, 18–21 cm longa et 2.8–3.3 cm lata, ad apicem attenuata, ad basim acuta, ad marginem leviter undulata, venis primariis ca. 7–8-jugatis angulo ca. 30–40° divergentibus; petiolus gracilis, 26–32 cm longus, ad dimidium vaginatus; geniculum 0.6–0.8 cm longum. Pedunculus 29–34 cm longus; spatha ± lanceolata, 8–11 cm longa et 1.3–1.6 cm lata, apice attenuato, basi acuto vel attenuato et breviter ansato; spadix ad 2.7 cm longus, stipite ca. 1 cm longo, latitudine duos flores aequans; flores bimeri, perianthii segmenta separata; pistillum cylindrico-obpyramidale, apice subtruncato vel obtuso-subconico, stigmate elato; ovarium 2-loculare, loculis uniovulatis, ovula solitaria oblonga in septo centrali prope basim locularem affixis; fructus ignotus.

Type collection: *G. Tessmann 4837*, "Ost-Peru: Stromgebiet des Marañon am Pongo de Manseriche, ca. 77°30′ West." 1924 (holotype G-DEL, isotype NY). Known only from the type collection. The typewritten label on the isotype sheet states "Puerto Melendez, below Pongo de Manseriche" as the collection locality.

S. gracilis is closely allied to *S. patulinervum*, but differs in (1) the narrower angle at which the primary lateral veins arise, and (2) the acute-cuneate base of the leaf-blade. The base of the blade of *S. patulinervum* is nearly obtuse and the margins are curved.

22. S. patulinervum Bunting, sp. nov. Figure 6.

Foliorum lamina obliqua, anguste oblongo-lanceolata, supra laete viridis, infra pallidior, 16.5–18.5 cm longa et 2.4–3.2 cm lata, ad apicem attenuato-acuminata, ad basim acuta, venis primariis 8–9-jugatis angulo 75–80° divergentibus; petiolus gracilis, 24–29 cm longus, ad ⅔ vaginatus; geniculum 0.6–0.8 cm longum. Pedunculus 31–33 cm longus; spatha lanceolata, 6.5–6.8 cm longa et 1.6 cm lata, apice longe-acuminato ad subcaudatum [1.5–2.5 cm longo], basi obliquo-acuto, albo, in aetate viridescenti; spadix laete viridis, 2.1 cm longus, stipite 4 mm longo; flores 2-meri, perianthii segmenta separata; pistillum plus minusve obpyramidale, apice truncato, stigmate papilliformi perianthium superanti; ovarium 2-loculare, loculis uniovulatis, ovula solitaria in septo centrali prope basim locularem affixis; spadix fructiferus ± tuberculatus; fructus obovoideo-sphaeroideus, ca. 3.5 mm longus, apice subtruncato, breviter rostellatus; semina 1 vel 2, reniformi-orbicularia in faciei obliqua, superficie plus minusve levi.

Type collection: *W. H. Camp E-1069*, "common on banks; lvs. bright green above, paler below; spadix bright green, spathe clear white, sometimes with green in center or along margins, and tip green, becoming pale green with age;

benches and slopes western side of Cutucu; 2000–2500 ft; Prov. Santiago-Zamora ("Oriente"); Cordillera Cutucu. ca. 2°40′S, 78°W," Ecuador; 17 Nov–5 Dec 1944 (holotype NY). Unicate. Known only from the type collection.

The narrow leaf-blade of *S. patulinervum*, with its primary lateral veins arising nearly perpendicularly to the midrib, is so characteristic that this species is described on the basis of the single unicate collection. The bimerous flowers and uniovulate locules of the ovary represent the ultimate reduction in this genus. It is closely allied to *S. gracilis*, which has the primary lateral veins arising at a strict angle to the midrib. Except the widespread *S. cannaefolium*, *S. patulinervum* is the only species of *Spathiphyllum* known from Ecuador.

Section 3. Spathiphyllum sect. **Dysspathiphyllum** Engl. Pflanzenreich. **4**^{23B}: 120. 1908. Figure 2K

Spathe flattened and reflexed, non-decurrent upon the peduncle; perianth membranous, of separate segments; pistil elongate, ± oblong in profile and conspicuously exceeding the perianth, the apex short-conic or blunt, terminated by a brush-like stigma. Plants 4 dm or more tall.

Type species: *Spathiphyllum huberi* Engl. Bot. Jahrb. **37**: 120. 1905. (*S. humboldtii* Schott.)

Distribution: Amazonian Peru, Venezuela, and Brazil; coastal French Guiana and Suriname.

23. S. humboldtii Schott, Aroid. **1**: 2. 1853. Figures 2K, 4.

Spathiphyllum candolleanum Schott, Prodr. Syst. Aroid. 429. 1860.
Spathiphyllum glaziovii Engl. Vid. Meddel. 756. 1879-1880.
Spathiphyllum huberi Engl. Bot. Jahrb. 37: 120. 1905.

Leaf-blade oblique, lanceolate to oblong-lanceolate or elliptic, 20–44 cm long and 5.5–14.5 cm wide, 2.5–4 times as long as wide, the apex acute-acuminate, the base obtuse or acute, sometimes subrotund, the primary lateral veins many, arising at an angle of ca. 45–60°; petiole (20–)32–68 cm long, 1–1.5 times as long as the blade, alate in the basal half or more; geniculum 1–2.5(–3) cm long. Peduncle 36–77(–96) cm long, often twice as long as the blade or longer; spathe lanceolate or oblong-lanceolate (4.6–)8–19(–26) cm long and 2–5.5(–6.6) cm wide, the apex attenuate or acuminate, the base obtuse and slightly clasping or narrowed to a short handle; spadix (1.5–)4–11 cm long, on a stipe (0.5–)1–3.5 cm long; perianth of 4 or 5 segments, free at the apex, connate in the basal one-third; pistil elongate, ± oblong in profile, the style prominently exceeding the perianth, the apex blunt or subconic, ending in an elevated brush-like stigma; ovary 2–3-locular, the ovules affixed near the base in each locule, varying from (5–)4 to 2(–1) in each of the locules and totaling 9–4 ovules per ovary; fruiting spadix rough; fruit elongate obovoid, blunt toward the apex and abruptly rostellate; seeds fewer than the ovules, comma-shaped in profile or irregularly compressed, the surface very verruculose and foveolate.

Type collection: *F. W. Hostmann 1154*, "Surinam" (lectotype K, isotypes BM, G-DEL, U). The holotype was deposited at Vienna, and probably burned. The Geneva sheet is labeled (perhaps erroneously) "Guyane Anglaise, 1843." Hostman is not known to have collected in British Guiana (Index Herb. **2**^{2}: 287. 1957).

Distribution: Wet forests along the coast of Dutch and French Guiana, along the Amazon River in Pará, Brazil, and Loreto, Peru, and in southernmost Venezuela.

BRAZIL: woods south of I.A.N., Belém, Pará, Jan 1943, *Archer 8204* (US); *Glaziou 10126* (C, P) (type collection of *S. glaziovii* Engl.); Tepeirinha pr. Santarém, Iguapé, Dec 1938, *Markgraf 3865* (RB).

FRENCH GUIANA: Cayenne, *Leprieur 1839* (G-DEL); sur la Montagne en Mahuri dans l'île de Cayenne, *Poiteau s.n.* (L); Jul 1824, *Poiteau s.n.* (K); Maroni, île Portal 1858, *Sagot 769* (BM); Maroni-en-fort, Aug 1910, *Santini 7773* (L); "Cayenne, No. 12" (L) (type collection of *S. candolleanum* Schott); "Guyane, herbier de M. Berbier" (P).

PERU: Canchahuaya, Río Ucayali, Loreto, Oct 1898, *Huber 1403* (MG) (type collection of *S. huberi* Engl.).

SURINAM: fluv. Saramacca sup., Feb 1922, *Gonggrijp & Stahel* (Herb. Surin.) *5* (U); Coppename R., Onobissi Kreek, Mar 1915, Sur. For. Bur. (B.W.) 1133a (U).

VENEZUELA: iguarapé forest of upper Río Yaciba, Terr. Amazonas, Dec 1953, *Maguire, Wurdack, & Bunting 36689* (NY, US).

There is considerable variability in this species but the lack of discernible pattern makes such variation of no taxonomic significance. Some specimens referred to *S. humboldtii* have bimerous flowers mixed with trimerous ones on the same spadix. Engler apparently overlooked this feature in all specimens except *Huber 1403,* which he described as type of *S. huberi.* The flowers of *Hostmann 1154* are either bi- or trimerous in the same spadix, with four or five perianth segments and a bi- or trilocular ovary. Notable variation also occurs in the form of the base of the leaf-blade, which may be obtuse, rounded, or even acute.

Engler and Krause (Pflanzenreich **4**^{23B}: 120. 1908) separated *S. candolleanum* from *S. humboldtii* by its smaller size, ovary shape, and number of ovules per locule. *S. glaziovii* was set apart in that publication by the slightly different shape of its leaf-blade and spathe, shorter petiole, and fewer ovules per locule. There are few differences other than size and mery between Englers's descriptions of *S. huberi* and *S. humboldtii.* I cannot find justification for maintaining these as separate species, since their differences seem to fall within the expected natural variation of a widespread species, in this case exemplifid by the differences between specimens of the type collection of *S. humboldtii.*

Jonker and Jonker (Fl. Suriname **1**: 28–30. 1953) recognized both *S. humboldtii* and *S. huberi,* separating them by the number of locules per ovary, and ovules per locule, as Engler had done. I cannot maintain *S. huberi* on these grounds. Though Jonker and Jonker incorrectly considered the locality of *Huber 1403* to be in Pará rather than Peru, their treatment[12] lends credence to the possible conspecificity of the material collected in Peru and Suriname, and suggests that *S. humboldtii* might be widespread in the Amazon basin.

The single Venezuelan collection identified as *S. humboldtii* varies most from the other material referred here, but it may simply represent a point in the constant variance of this widespread species. Subsequent collections from the Amazon drainage may prove it to represent an unknown species.

S. humboldtii can be separated from all other species by its non-decurrent spathe, long-stiped spadix, and elongate pistil with the style very prominently exserted beyond the perianth.

Section 4. Spathiphyllum sect. Spathiphyllum.

Massowia subg. *Samowia* K. Koch, Bonplandia 4: 11. 1856.
Spathiphyllum sect. *Euspathiphyllum* Engl. in DC. Monogr. Phan. 3: 220. 1879.

---

[12] Jonker and Jonker considered two Suriname collections to be conspecific with *Huber 1403* (type of *S. huberi*).

Spathe erect, cucullate, conspicuously decurrent on the peduncle; segments of the perianth membranous, separate, or conglutinate or connate toward the base; pistil typically much exceeding the perianth, apically conic to attenuate. Plants mostly 5 dm or more tall.

Type species: *Spathiphyllum lanceaefolium* (Jacq.) Schott, Melet. Bot. 22. 1832 (which is also the generic type).

Distribution: Mexico, Central America, coastal Venezuela and Colombia.

24. S. friedrichsthalii Schott, Aroid. **1**: 2. *pl. 4.* 1853. Figure 7.

Spathiphyllum fendleri Schott, Oesterr. Bot. Wochenbl. **7**: 159. 1857.
Spathiphyllum friedrichsthalii var. *brevifolium* Engl. Bot. Jahrb. **6**: 280. 1885.

Leaf-blade oblique, typically narrowly elliptic to oblanceolate, varying to broadly elliptic, widest at or just above the middle, 25–48(–70) cm long and 8–17(–22) cm wide, the apex acuminate-cuspidate, the base cuneate or acute, the primary lateral veins many, arising at an angle of 60–75°; petiole equaling or to 1.5 times as long as the blade, 24–50(–87) cm long, prominently winged nearly or quite to the geniculum; geniculum (1.2–)1.7–2.7 cm long. Peduncle mostly 2–3 times as long as the blade, 50–90(–127) cm long; spathe strongly naviculate, broadly oblanceolate to elliptic, 12–14(–33) cm long and (3.5–)4.5–8(–9.2) cm wide, typically broadest above the middle, the apex long-acuminate-cuspidate [1.5–4 cm long], the base cuneate and decurrent on the peduncle 2.5–4.5(–6) cm; spadix 3–7(–9.8) cm long, stout, densely flowered, sessile or on a stipe to 0.5(–1.0) cm long; perianth of separate segments; pistil greatly exceeding the perianth, the style subcylindric, fluted, apically blunt, the stigmatic area prominent; ovary (2–)3-locular, the ovules superposed, varying from 8 to 5(–3) in each of the 3 locules, totaling 24–15(–12) ovules per ovary; fruiting spadix roughened by the persistent styles; fruit obovoid, rostrate; seeds as many as the ovules or fewer, oblique-reniform to oblong in profile, the surface commonly smooth or occasionally verruculose between the vertical rows of foveola.

Type collection: *C. W. Dodge & V. F. Goerger 9414,* "in Gynaerium sagittatum thickets along Río Reventazón below farmhouse, Finca Castilla," 30 m, prov. Limón, Costa Rica, 27 Jul 1936 (neotype F, duplicate MO). The holotype, *Friedrichsthal s.n.,* deposited at Vienna, was probably burned. No duplicates of this collection have been found.

Distribution: Caribbean coastal forests of Nicaragua, Costa Rica, and Panama, along the shores of Barro Colorado Island in Gatún Lake, along the coast of the Gulf of Urabá, Colombia, and southward along the Pacific slope of Colombia to the Patía Valley (Nariño).

COSTA RICA: Hacienda de Boston, United Fruit Co. 291 (US). Alajuela: vic. of Los Chiles, along Río Frio (11°02′ N, 84°44′W), Aug 1949, *Holm & Iltis 795* (F, G-DEL, NY, U). Limón: near farmhouse at Finca Castilla, along Río Reventazón, Jul 1936, *Dodge & Goerger 9499* (MO); Sigüirres, Feb 1932, *Kupper 581* (M); bosque de Suerre y Dos Bocas, drenajes de los Ríos Parismina y Reventazón, Oct 1951, *Shank & Molina R. 4173* (US); Hamburg Finca, on the Río Reventazón below Cairo, Feb 1926, *Standley & Valerio 48861* (US); Finca Montecristo, on the Río Reventazón below Cairo, Feb 1926, *Standley & Valerio 49023* (US).

NICARAGUA: vic. of El Recreo, dept. Bluefields, Apr 1947, *Long 47* (F); area de la Bahía de Bluefields, Río Escondido, dept. Zelaya, breñas a lo largo del Río Yanten, Apr 1949, *Molina R. 2083* (F); guamil de la región de Toumarin a lo largo del Río Grande, Apr 1949, *Molina R. 2412* (F); Castillo El Viejo, *Shimek & Smith 420* (NY); am Strands bei Laguna in Bluefields, Mosquito, Mai 1855, *Wullschlaegel 1766* (BR).

PANAMA: *Moore 13* (F, US); *Seeman s.n.* (BM). Bocas del Toro: Water Valley, Sep 1940, *von Wedel 820* (MO); vic. of Chiriquí Lagoon, Water Valley, Oct 1940, *von Wedel 1360* (F, G, MO); vic. of Chiriquí Lagoon, Water Valley, Nov 1940, *von Wedel 1506* (F, G, MO); vic. of Chiriquí Lagoon, Big Bight, Isla Colón, Nov 1941, *von Wedel 2979* (F, MO);

Río Cricamola, between Finca St. Louis and Konkintoe, Aug 1938, *Woodson, Allen, & Seibert 1912* (F, G, MO).

CANAL ZONE: Mojinga Swamp near mouth of Río Chagres, Mar 1935, *Allen 855* (F), *861* (B, G-DEL, MO, NY, S, U, US); between Mt. Hope and Santa Rita Trail, Feb 1905, *Cowell 54* (NY); ''Chagres,'' mouth of Río Chagres, Mar 1850, *Fendler 426* (K, MO) (type collection of *S. fendleri* Schott); Oct 1859, *Hayes 82* (G); Gatún Station, Panama R.R., Oct 1859, *Hayes 96* (NY); swampy places along Panama R.R., Gatún, Feb 1860, *Hayes 533* (NY); in swamps along the Panama R.R., Nov 1859, *Hayes 539* (NY); along edge of Río Indio de Gatún, Feb 1911, *Maxon 4821* (F, US); Gatún, Jan 1858, Fasc. 1, *Wagner 591* (#275 on tag on petiole) (M). Barro Colorado Island, C.Z.: 1931, *Aviles 48* (F); Jun 1931, *Bailey & Bailey 271* (BH); shore, P.N. 11, end of island, Sep 1929, *Bangham 567* (F, G); Aug 1928, *Chickering 35* (MICH); lake shore, Aug 1927, *Kenoyer 195* (US); along shore of Gatún Lake, e of laboratories, Nov 1948, *Killip 40037* (UC, US); Miller rear light, Dec 1931, *Shattuck 581* (F); shore near lighthouses, Feb 1932, *Woodworth & Vestal 656* (F, G); Nov 1938, *Zetek Z-4320* (F). Colón: vic. of Palenque, Aug 1911, *Pittier 4122* (US).

COLOMBIA: vic. of Villa Arteaga, Aug 1948, *Brahe, Araque M., & Barkley 18C701* (COL, UC, US). Antioquia: Estación ''Camilo c. Restrepo,'' Apr 1955, *Daniel 4947* (NY); near Guapá, 53 km s of Turbo, Apr 1945, *Haught 4598* (COL, US); Urabá, entre Mutatá y Pavarandocito, Jan 1950, *Uribe U. 2038* (COL). Cauca: Noanamito, Río Micay, Feb 1943, *Cuatrecasas 14217* (US). Chocó: cerca al Río Atrato, en los alrededores de Quibdó, Jan 1949, *Araque M. & Barkley 19Ch049* (COL, US); Quibdó, Río Atrato, Apr-Mai 1931, *Archer 1796* (US); trocha de Utría al Valle, Jun 1950, *Fernandez 273* (COL, US); Andagoya, Apr 1939, *Killip 35076* (COL, S, US); Corcovada region, upper Río San Juan, ridge along Yeracui Valley, Apr 1939, *Killip 35275* (COL, F, US); Río Truandó, 1858, *Schott 3* (NY); *Triana s.n.* (label partially burned) (BM). Nariño: Isla de Gallos, Pacifico, Feb 1942, *Dryander 2589* (US); Rives du Río Mira, Oct 1899, *Langlassé 2* (G, K, US); Patía Valley, *Lehmann K.375* (F, K); Pasto, *Lehmann R.1* (K). El Valle (Valle del Cauca): Río Yurumanguí, Jan-Feb 1944, *Cuatrecasas 15969* (US); Río Calima, La Trojita, Feb-Mar 1944, *Cuatrecasas 16366* (US); Córdoba, Dagua Valley, Mai 1922, *Killip 5034* (G, NY, US); Córdoba, Feb 1939, *Killip & Garcia 33397* (COL, F, G, MO, S, US); Sabaletas, km 29 of highway from Buenaventura to Cali, stream bed, Río Sabaletas, Jun 1944, *Killip & Cuatrecasas 38859* (COL, F, US); Río Dagua, Buenaventura litoral, Jan-Mai, *Lehmann 5361* (F, K, L, NY).

Vernacular names: Colombia: "niño en la cuna" (Choco); "cansitta garza" (Isla de Gallos).

This species is well marked by the large number of ovules per locule, and the large spathe and proportionally short, stout spadix. It is widely distributed and is often collected.

With the original description of *S. friedrichsthalii* was the note: ''Habit. Guatemala. (Friedrichsthal. Herb. Caes. Vindob.).'' It appears that some error occurred in labeling the collections of Friedrichsthal, for detailed studies indicate that this species does not extend as far north as Guatemala, but reaches its northern limit in southern Nicaragua. This error of labeling is corroborated by Øersted (Jour. Bot. Hooker. **5**: 46. 1853): ''The Austrian botanist Friedrichsthal performed journeys through a great part of Nicaragua and Costa Rica in 1839, and appears to have made great collections of plants.'' Some years later, Hemsley (in Godman & Salvin, Biol. Centr. Am. **4**: 128. 1887) wrote: ''In 1839 Emanuel Friedrichsthal 'performed journeys through a great part of Nicaragua and Costa Rica'; yet all the plants of his collecting in the Kew Herbarium are labeled Guatemala. We believe the first set of his collections is at Vienna.''

S. friedrichsthalii has been confused by many authors. Standley (Ann. Missouri Bot. Gard. **31**: 35. 1944) treated this species, but I do not agree with his remarks (discussed here under *S. phryniifolium*). Matuda (Anal. Inst. Biol. México **25**: 126. 1954) attributed it to the flora of Chiapas (Mexico); specimens cited by him represent *S. matudae*. As an example of *S. friedrichsthalii*, Matuda presented a photograph of *Standley 5007*. It is a specimen collected near Lancetilla, Honduras, which I refer to *S. blandum,* though indeed it is aberrant for that species.

In synonymy under this species Engler listed *S. lanceolatum* C. Koch and *Massowia lanceolata* C. Koch. The present study indicates that these names are synonyms of *S. cochlearispathum* (which see).

Engler described var. *brevifolium* of *S. friedrichsthalii* based upon a collection from southwestern Colombia (*Lehmann 2751,* deposited at Berlin, and presumably destroyed). Study of the relatively small amount of material available from this large region, while more than Engler had for examination, offers little justification for a named variety.

25. S. cochlearispathum (Liebm.) Engl. in DC. Monogr. Phan. **2**: 221. 1879. Figure 8.

Hydnostachyon cochlearispathum Liebm. Vid. Meddel. **1-2**: 24. 1849-50.
Hydnostachyon longirostre Liebm. Vid. Meddel. **1-2**: 24. 1849-50.
Spathiphyllum liebmanni Schott, Aroid. **1**: 2. 1853.
Spathiphyllum heliconiaefolium Schott, Aroid. **1**: 2. *pl. 5, 6.* 1853.
Spathiphyllum longirostre (Liebm.) Schott, Aroid. **1**: 2. 1853.
Massowia lanceolata C. Koch, Bonplandia **4**: 12. 1856.
Spathiphyllum lanceolatum C. Koch, Berl. Allg. Gart. **25**: 174. 1857.
Spathiphyllum cochlearispathum (Liebm.) Engl. var. *longirostre* (Liebm.) Engl. in DC. Monogr. Phan. **2**: 221. 1879.
Spathiphyllum lacustre Lund. Contr. Univ. Mich. Herb. **6**: 4. 1941.

Leaf-blade oblong or oblong-lanceolate to narrowly elliptic, widest at or just below the middle, 45–65(–80) cm long and 15–23(–28) cm wide, the apex acuminate or cuspidate, the base subrotund or rarely obtuse or subcordate; primary lateral veins many, arising at an angle of 60–75°; petiole 40–80(–104) cm long, prominently alate nearly or quite to the geniculum, the wings finely mottled with white and often crinkled-crisped along the margins (as are the cataphylls); the geniculum 3–5 cm long. Peduncle 50–90(–139) cm long; spathe cucullate, oblanceolate or elliptic, 18–33 cm long and 6–10 cm wide, the apex acuminate, the base subcuneate or attenuate and decurrent on the peduncle 3.5–7(–9.5) cm; spadix 5.5–11.5 cm long, sessile or on a stipe to 1(–1.8) cm long; perianth of separate segments; pistil attenuate-conic, ca. twice as long as the perianth (in flower); ovary 3-locular, the ovules superposed, varying from (6–)5–2 in each of the 3 locules, totaling 16–6 ovules per ovary; fruit obovoid, rostrate, ca. 1 cm long [the beaked portion ca. 3–4 mm]; seeds ca. as many as the ovules, irregularly oblique-ovoid to oblong in profile, ca. 4 mm long, the surface smooth and shiny between the vertical rows of foveola.

Type collection: *F. M. Liebmann s.n.* (here designated by me *M41A*), "in sylvis umbrosis circa Mirador," Veracruz, Mexico, Nov 1841 (lectotype C, isotype [designated by me *M41B*] C). I cannot accept as duplicates of the lectotype the two sheets of *Leibmann s.n.* (designated by me *M41C* and *M41D*).

Distribution: Rainforests of the Caribbean coast of Mexico, in Veracruz, eastern Oaxaca and Chiapas, Tabasco, and at cenotes in Yucatán.

MEXICO: Veracruz: Chiquihuite prés Potrero, Mar 1866, *Bourgeau 2215* (K); Vallée de Córdova, Omealco, Oct 1866, *Bourgeau 3261* (G-BOIS, P); *Karwinski s.n.* (specimens tagged no. "273" & "274") (M); Atoyac, Dec 1882, *Kerber 7B* (US); circa Colipa, *Liebmann s.n.,* designated *C41E* (C) (type collection of *Hydnostachyon longirostre Liebm.*); circa Mirador, Nov 1841, *Liebmann s.n., designated M41C & M41D* (C); "Zacuapam" (probably intended as Axocuapan), Jul 1926, *Purpus 10781* (US); El Mirador, Apr 1935, *Purpus 16445* (F). Oaxaca: Tepinapa to Jocotepec, Mar 1919, *Reko 4092* (US). Chiapas: Ocozocoantla, 5 hrs. horseback trip n from El Refugio to Rancho Aguajito, Mai 1949, *Carlson 2126* (F).

Tabasco: lakeside at Ojo de Agua near Balancán, Mai 1939, *Matuda 3136* (F, GH, MICH) (type collection of *Spathiphyllum lacustre* Lund.). Yucatán: cenote at San José, Chichén Itzá, Jun 1932, *Steere 1592* (MICH).

CULT.: In large pot, Hotel Francia, Oaxaca de Juárez, Mexico, Mar 1940, *Bailey 552* (BH); Hort. M. Devansaye, Jan 1879 (K); *Engler 17* (B, C, G-BOIS, G-DEL, GH, L, P, US); Fragment and outline of type specimen of *S. lanceolatum* C. Koch, *Brown s.n.* (K); etc.

Vernacular names: Veracruz: "chil de gatos"; Oaxaca: "hoja de piedra."

This is the northernmost species of the genus, extending nearly to 20° N. latitude in Veracruz, Mexico. Some of the material referred here is more or less anomalous, but the species is poorly collected and imperfectly understood.

S. cochlearispathum was initially described in *Hydnostachyon*. That genus was differentiated from *Spathiphyllum* by a unilocular ovary. The ovary, however, is clearly trilocular in all specimens originally assigned to *Hydnostachyon*, and Schott correctly referred them to his earlier-described genus *Spathiphyllum* in 1853.

Engler (Monogr. Phan. **2**: 221. 1879) placed *S. longirostre* as a variety of *S. cochlearispathum*, which treatment he retained in 1908 (Pflanzenreich **4**^{23B}: 122). I cannot justify the recognition of var. *longirostre*. The type specimen of *S. cochlearispathum* and of *S. longirostre* are so similar that they are here treated as conspecific.

Matuda (Anal. Inst. Biol. México **25**: 124. 1954) accepted *S. lacustre* Lund., based upon a single collection (*Matuda 3136*) from Tabasco. To maintain it apart from *S. cochlearispathum* seems unwarranted, since the type specimen of *S. cochlearispathum* and of *S. longirostre* possess the characteristics stated by Matuda for separating them from *S. lacustre*. All have five to three ovules per locule and the geniculum varies from three to five centimeters in length.

A Karwinski specimen (M) from Mexico (locality unknown) is annotated "Spathiphyllum longirostre Schott, ipse." It is very different from the holotype of *S. longirostre*. If conspecific, these elements must represent the extremes of variation in the species. Though cited here, the Karwinski collection was not considered in preparation of the description of *S. cochlearispathum*. It resembles most nearly *Matuda 3136* from Tabasco, and is similar to two Liebmann specimens [s.n., designated by me *M41C* and *M41D* (C)] from Mirador, Veracruz.

The most interesting, and perhaps most nearly distinct form referred here is a collection from a "cenote" at Chichén Itzá, Yucatán (*Steere 1592*), with a proportionally wider leaf-blade, a longer petiole and shorter peduncle, and a spathe more shortly decurrent on the peduncle than is typical. When material is available from other "cenotes" in that region, a clearly defined taxon may become apparent and deserve recognition.

It appears that *S. lanceolatum* C. Koch is synonymous with *S. cochlearispathum* rather than with *S. friedrichsthalii* as treated by Engler. This may never be satisfactorily resolved because the holotype of *S. lanceolatum* was probably burned at Berlin. However, a Kew sheet prepared by N. E. Brown (12 Jul 1878) consists of a drawing (an "outline of the type specimen! in Herb. C. Koch!") and a fragment ("a few ovaries from C. Koch's type!"). The "ovaries" contain fifteen or sixteen ovules, and the dimensions of the outline of the leaf-blade and spathe agree with those of this species rather than of *S. friedrichsthalii*.

Material of *Engler 173*, distributed under the incorrect identification of *S. lanceolatum* C. Koch, does not belong here (see under *S. kochii*).

26. S. matudae Bunting, sp. nov. Figure 8.

Foliorum lamina obliqua, e lanceolata ad elliptico-lanceolatam vel aliquando subovatam, sicca supra valde fusca, infra pallidior, 36–48(–60) cm longa et 13–23 cm lata, ad marginem undulata, ad apicem e acuto-acuminata ad deltoideam (foliorum latiorum), ad basim obtuso-subrotundata, venis primariis multis angulo 60–70° divergentibus; petiolus laminam longitudine subaequans, 35–50 (–60) cm longus, ad ⅔ vaginatus, vagina ad apicem conspicue auriculata; geniculum 2.5–4.5(–5.5) cm longum. Pedunculus quam lamina 1.5–2-plo longior, 50–70(–105) cm longus; spatha cucullata, elliptica vel oblongo-elliptica, 15–27 cm longa et 5–8(–10) cm lata, apice attenuato-acuminato [acumine ad 5 cm longum], basi acuto et in pedunculo 2.5–5.5(–9) cm decurrenti; spadix 4.5–9.5 (–11.5) cm longus, stipite 0.6–2(–2.5) cm longo; perianthii segmenta separata; pistillum leviter constrictum inter ovarium et (plus minusve inflatum) stylum, apicem versus attenuatum et exsertum; ovarium (2–)3-loculare, loculis 5–2-ovulatis, ovulis plerumque superpositis, 13–7 in toto ovario; spadix fructiferus tuberculatus; fructus obovoideus vel ellipsoideus, breviter ad longe rostratus; semina ovula numero aequantia, ex obliquo-ovoidea ad plus minusve oblonga in faciei obliqua, inter foveolarum ordines verticales superficie levi.

Type collection: *E. Matuda 17645*, "Cacaluta, Escuintla," Chiapas, Mexico, 29 Mar 1948 (holotype NY, isotype F).

Distribution: Pacific slope of southernmost Mexico, Guatemala and adjacent El Salvador.

MEXICO: Chiapas: Esperanza, Escuintla, Mai 1947, *Matuda 16561* (F); Esperanza, Escuintla, Sep 1947, *Matuda 17013* (F, NY); Islamapa, Huehuetán, Jun 1948, *Matuda 18022* (F); Escuintla, Mai 1938, *Matuda 2742* (MICH).

GUATEMALA: Amatitlán: Barranca de Eminencia, Feb 1892, *J. D. Smith 2790* (US). Escuintla: Escuintla, Mar 1890, *J. D. Smith 2241* (US); plain near Río Sinacapa, se of Escuintla, Mar 1941, *Standley 89241* (F); along Río Guacalate, nw of Escuintla, Mar 1941, *Standley 89292* (F); barranco of Río Burrión, ne of Escuintla, Mar 1941, *Standley 89602*. Quezaltenango: Finca San José Buena Vista, Colomba, *Lewis s.n.* (F); Las Nubes, Volcán de Zunil, Feb 1874, *Salvin s.n.* (K); Finca Pirineos, below Sta. María de Jesús, Mar 1939, *Standley 68204* (F), *68231* (F); along old road between Finca Pirineos and Patzulín, Feb 1941, *Standley 86896* (F), *86905* (F); *86966* (F); Finca Pirineos, lower S-facing slopes of Volcán Sta. María, between Sta. María de Jesús and Calahuachi, Dec 1939, *Steyermark 33202* (F). San Marcos: above Finca El Porvenir, up Loma Bandera Shac, lower S-facing slopes of Volcán Tajumulco, Mar 1940, *Steyermark 37352* (F). Santa Rosa: Río La Plata, Jan 1893, *Heyde & Lux 4655* (US); hills e of Cuilapa along stream supplying the city water, Nov 1940, *Standley 78162* (F); region of Platanares, between Taxisco and Guazacapán, Dec 1940, *Standley 79067* (F), *79070* (F). Suchitépequez: near Santiago farm, vicinity of Tiquisate, Jun 1942, *Standley 47636* (F); near Pueblo Nuevo, Mar 1939, *Standley 66857* (F).

EL SALVADOR: Ahuachapán: Sierra de Apaneca, in the region of Finca Colima, Jan 1922, *Standley 20166* (GH, US).

Vernacular names: Mexico: "bushna." Guatemala: "gusnay," "bushnay," "huisnay," "güisnay." El Salvador: "huisnay."

The previously unrecognized species *S. matudae* is distributed along the Pacific slope from southernmost Mexico to El Salvador. The long-attenuate pistil of the Chiapas and westernmost Guatemalan material is similar to that in the El Salvador collections. In Guatemala, however, the style exhibits various forms from attenuate to rostellate, and certain specimens (e.g., *J. D. Smith 2241, 2790*) show a relation to *S. brevirostre*, especially in the form of the style.

The type collection of *S. matudae* was selected from the Chiapas material, and the species was named to honor its collector, Eizi Matuda.

Distinctive features of *S. matudae* are the broadly obtuse base of the leaf-blade, the relatively long geniculum, and the constriction of the pistil between the ovary and the style. The leaf-blade is widest below the middle, and is typically twice to three times as long as wide, thus differing from those of *S. cochlearispathum,* which are more or less oblong, widest at the middle, and proportionally narrower than the blades of *S. matudae.*

This species has the common name "huisnay" (or some variation of it) throughout its range. Collectors report that the natives eat the spadices either cooked with eggs, or cooked and pickled in vinegar. In the narrative of his travels, Preuss (Exped. Zentr. Südam. 123: 1901) noted this practice. Preuss' specimen, cited by Engler as *S. ortgiesii,* appears to be no longer extant. It was collected at San Andres-Osuna, northwest of the city of Escuintla, Guatemala. Undoubtedly, his specimen was conspecific with *S. matudae* rather than with *S. ortgiesii.* Engler and Krause (Pflanzenreich **4**^{23B}: 122. 1908) cited *J. D. Smith 4625* (Santa Rosa, Guatemala) as *S. friedrichsthalii.* I have not seen it, but its locality suggests that it also may represent *S. matudae.*

27. S. grandifolium Engl. Bot. Jahrb. **37**: 119. 1905. Figure 5.

Leaf-blade oblique, ovate-oblong, 47 cm long and 24 cm wide, the apex acuminate-cuspidate, the base obtuse-rotund, the many pairs of primary lateral veins arising at an angle of 60–70° (–80°); petiole 54 cm long, alate below, the geniculum 2 cm long. Peduncle* equaling the petiole; spathe elliptic-oblong, 20 cm long and 5 cm wide, the apex attenuate, the base cuneate and decurrent on the peduncle 3.2 cm; spadix* 15 cm long, on a stipe 1 cm long; perianth* of separate segments; pistil* rostellate but scarcely exserted above the perianth, locules* of the ovary 4-ovulate; fruit unknown.

Type collection: *F. C. Lehmann 563,* "auf dem Boden in dichten Regenwäldern bei Altaquer an den Westabhängen das Cordilleren von Pasto, 1000 m.," Nariño, Colombia, Mar 1881 (holotype B). Unicate, presumably. Known only from the type collection.

S. grandifolium is closely related to *S. atrovirens* of Costa Rica, but its spathe is more shortly decurrent than in the latter species.

28. S. wallisii Regel, Gartenflora **26**: 323. *pl. 920.* 1877.

Leaf-blade lanceolate- to oblong-elliptic (14–)24–36 cm long and (3–)5–10 cm wide, marginally undulate, the apex long-acuminate, recurved at the tip, the base acute, the midrib nude in the lowermost 2 cm above the geniculum, the primary lateral veins ca. 8–10 pairs arising at an angle of 45–50°; petiole subequaling the blade or a little longer, to 45 cm long, commonly alate in the lower part or nearly to the geniculum; geniculum 1.4–2.3 cm long. Peduncle longer than the petiole, ca. 20–64 cm long; spathe cucullate, ovate to oblong-elliptic, 7–17 cm long and 2.5–7.5 cm wide, the apex long-acuminate [to 2.5 cm], the base commonly obtuse or subrotund, sometimes acute, decurrent on the peduncle 1.5–4 cm or more, white, becoming green in age; spadix fragrant, 1.5–8 cm long, on a stipe 0.5–1.2 cm long; perianth white, of separate segments; pistil ± elliptic in outline, the style conic, white, prominently exserted beyond the perianth; ovary 3-locular, with 4–3(–2) ovules ± fascicled in each of the 3 locules, totaling 12–6 ovules per ovary; fruit unknown.

Type: the original description. *S. wallisii* was described from a plant growing in cultivation (in Europe); apparently no type specimen was preserved [Int. Code Bot. Nomencl. (1956) Art. 10, note]. Known only in cultivation.

CULT.: in big pot, Hotel Francis, Oaxaca de Juárez, Mexico, Mar 1940, *Bailey 550* (BH); F. Sander & Co., 22 Feb 1898, *Brown s.n.* (K); Kew Gardens, 17 Oct 1912, *Harvey 608*/1911, *Brown s.n.* (K); 6 Apr 1914, *Thompson 10* (MO); Garfield Park Cons., 3 Aug 1939 (F); etc.

S. wallisii was reportedly introduced from Colombia, but this has not been corroborated. It was originally described from a young plant growing in a garden and flowering for the first time. If a type specimen was preserved by Regel, it is probably in the herbarium at Leningrad. No specimens deposited at Leningrad have been available for this study.

---

*fide Engler (1908): parts lost from the type specimen.

No material other than from cultivated plants has been referred to this species since its publication. Despite the lack of a type specimen, the available data and the illustration which accompanies the original description characterize a species very similar to the well-known plant of our conservatories and of plantsmen known as *S.* ''clevelandii.''

Certain small discrepancies may be noted between Regel's description and illustration of *S. wallisii* and the currently cultivated *S.* ''clevelandii,'' especially in the spathe, which was described originally as oblong-elliptic. *S.* ''clevelandii'' has a spoon-shaped spathe which is commonly ovate in outline, varying to elliptic. The shape of the base and apex of its spathe agrees with the original description of *S. wallisii*, and other characteristics are similar enough that I feel entirely justified in regarding *S.* ''clevelandii'' as conspecific with *S. wallisii.*

Except for a few dried specimens borrowed from European herbaria, I have no knowledge of what plant is currently offered in Europe under the name *S. wallisii.* The treatment presented here is in agreement with N. E. Brown (Kew specimens), and T. H. Everett and E. J. Alexander (Gard. Chron. Am. II. **48**: 209. 1944).

According to the records of the Bailey Hortorium (fide G. H. M. Lawrence, in personal correspondence), ''S. clevelandii originated in the American trade with Julius Roehrs & Co., who offered it for the first time in 1935.'' The Hortorium has ''no record of its appearance in European lists prior to 1938,'' though its records are incomplete for Germany. ''Spathiphyllum wallisii appears to have first come into cultivation in Europe about 1936.''

Birdsey (Cult. Aroids 118. 1951) noted that Mr. R. G. Wilson of Miami had grown from seed many plants of *S.* ''clevelandii'' which were quite uniform in appearance. This statement lends support to the idea that it is a self-perpetuating taxon, and probably a natural species. Yet Birdsey wrote that it is a putative ''hybrid produced by W. A. Manda in the time of President Cleveland.'' He presented (op. cit. 119) an excellent photograph of *S.* ''clevelandii'' under the name *S. kochii*, rejecting the name *S. wallisii* because of the small dimensions given by Regel in the original description. *S. kochii* differs from *S. wallisii* in its greater size and its proportionally broader leaf-blade which is obtuse at the base.

The narrow leaf-blade on a slender petiole together with the conic style of the pistil easily differentiates *S. wallisii* from other species of this section.

29. S. wendlandii Schott, Oesterr. Bot. Zeitschr. **8**: 177. 1858. Figure 7.

Leaf-blade oblanceolate to elliptic, 22–50 cm long and 9–17(–21) cm wide, the apex cuspidate, the base attenuate and decurrent onto the geniculum, the primary lateral veins many, arising at an angle of 45–60°; petiole 18–45(–60) cm long, vaginate below and often prominently alate throughout its length, the wing continuous with the decurrent base of the leaf-blade; geniculum 1.2–2 cm long, alate, to 3 cm or more wide and marginally involute and crisped, or deeply sulcate but not alate and the petiole nude in the upper 5–17 cm. Peduncle (35–)45–82 cm long; spathe elliptic to oblong-oblanceolate, the apex attenuate-acuminate, the base attenuate, decurrent on the peduncle 3–6(–9) cm; spadix 2.5–

7.5(–8.7) cm long, sessile or on a stipe to 1 cm long; perianth segments separate at the apex, partially conglutinate at the base (at least in age), the apex fimbriate or erose and often deeply notched in the center; pistil narrowly elongate, shortly exserted beyond the perianth; ovary (2–)3-locular, the ovules affixed near the top of the locules, superposed, varying from 4–2(–1) in each of the 3 locules, totaling 11–6(–3) ovules per ovary; fruit unknown.

Type collection: *M. C. Pachero 93,* "Lago Bruille (?), Cartago," Costa Rica; 1 Jan 1946 (neotype F). Unicate. This specimen most nearly agrees with the original description and with Schott's drawing of *S. wendlandii* (W). The holotype (*Wendland 722,* Cuesta de Congo, pr. San Miguel, Costa Rica, 1875) is doubtfully extant; it was probably deposited at Vienna, and burned with the other Araceae. A fine photograph of the type specimen (Field Mus. no. 29839) further exemplifies this species.

Distribution: Wet forests of the Caribbean slope of central Costa Rica, and in adjacent Chiriquí, Panama.

COSTA RICA: Alajuela; San Luis de Zarcero, Feb 1938, *A. Smith H337* (F); San Luis de Zarcero, canton Alfaro Ruiz, Jul 1938, *A. Smith 857* (F, NY); hills above Zapote, canton San Carlos, Jul 1938, *A. Smith 927* (F, NY). San José or Cartago: Santiago de San Ramón, Jul 1937, *Brenes 22626* (F); vicinity of El General, Dec 1936, *Skutch 3033* (US); Río Verde, Llanuras de Sta. Clara, Mai 1896, *J. D. Smith 6817* (GH, US); vicinity of Sta. María de Dota, Dec 1925-Jan 1926, *Standley & Valerio 44088* (US). Limón: in forest near Banana R., Port Limón, Mai 1903, *Cook & Doyle 425* (US); vicinity of Guápiles, Mar 1924, *Standley 37350* (US); colline de Sikurbeta, Talamanca, Feb 1895, *Tonduz 9398* (BR, US), *Tonduz 9399* (BR).

PANAMA: Chiriquí: Chiquero, Boquete Distr., Apr 1938, *Davidson 565* (F, MO, US).

S. wendlandii is outstanding for its fringed and/or notched perianth segments, its pistil which is very narrowly elongate but only shortly exserted beyond the perianth, and its winged geniculum (in the typical form). Despite the narrow range of this species, two forms may be distinguished. The geniculum may be alate by the continuation of the petiolar wing to the blade, or the geniculum may not be alate. All specimens without an alate geniculum are from higher altitudes (*Brenes 22626, Skutch 3033, A. Smith H337, 857, 927, Standley & Valerio 44088, Davidson 565*). Specimens with an alate geniculum are from adjacent areas of lower elevation down to the coast. The specimens from higher altitudes are smaller and the leaf-shape somewhat different. With the accumulation of more specimens, these forms may deserve naming.

Previous descriptions of *S. wendlandii* characterized the locules of the ovary as six-ovulate. Among the material referred to this group, the locules typically contain four or fewer ovules. The description is accordingly emended, and this species is placed next to *S. ortgiesii* rather than *S. cochlearispathum.*

Standley (Field Mus. Publ. Bot. **18**: 143. 1937) merged *S. wendlandii* with *S. friedrichsthalii,* under the latter name. These two species are totally distinct. *S. wendlandii* differs by the smaller number of ovules per locule and notched and/or fringed perianth segments.

30. S. ortgiesii Regel, Gartenflora **21**: 292, 293. *pl. 738* (facing p. 322). 1872. Figure 8.

Leaf-blade elliptic-oblanceolate to broadly elliptic, very oblique, 37–59 cm long and 15–26 cm wide, the apex cuspidate, the base cuneate and finally decurrent onto the geniculum forming a crinkled wing continuous with the wing of the petiole; primary lateral veins arising at an angle of 45–60°, passing without interruption into the wing of the petiole; petiole ca. 20–48 cm long, alate throughout its entire length; geniculum alate, 1.5–3 cm long and 1–2.4 cm wide. Peduncle to 55 cm long; spathe oblanceolate or oblong-elliptic, 12–31 cm long and 5–9 cm wide, the apex short-acuminate, the base cuneate and decurrent on the peduncle (3–)5–8 cm; spadix 5–10 cm long, on a stipe 0.5–1.8 cm long; segments of the perianth separate, entire at the apex, the apical portion erect and forming a collar around the pistil; pistil often constricted between the style and ovary, the style elongate-conical, scarcely exserted beyond the perianth; ovary 3-locular, with 3–2 ovules affixed very near the base of each of the 3 locules, totaling 8–6 ovules per ovary; fruit unknown.

Type: the original description [Int. Code Bot. Nomencl. (1956) Art. 10, note]. *S. ortgiesii* is further defined by an illustration of this species in the same volume as the original description. At Kew there is a representative specimen of *S. ortgiesii* labeled only "Hort. Kew., 12 Jul 1878, N. E. Brown." The specimen was taken from a plant in cultivation; it was prepared by a competent botanist at a time contemporary with the publication of *S. ortgiesii,* and possibly represents material from the original introduction (by Roezl?).

Distribution: Wet slopes near Santiago Tuxtla in southern Veracruz, Mexico.

MEXICO: Veracruz: steep wet ravine slopes 1.5 miles below Santiago Tuxtla, Apr 1952, *Moore 6270* (BH, NY).

CULT.: Hort. Kew, 12 Jul 1878, *N. E. Brown s.n.* (K); *Engler 79* (B, G, K, L, P, US); etc.

Regel (Gartenflora **19**: 39. 1870) stated that this species was probably introduced (into cultivation) by Roezl from Mexico. The initial description was undoubtedly drawn from a living plant (from the botanical garden in Zürich). *S. ortgiesii* continued to be known only in cultivation until the present.

No type specimen of this species appears to have been preserved; if there is one, it must be deposited at Leningrad where Regel worked, and was unavailable for this study. Older specimens examined were of garden origin (mostly *Engler 79*), and possibly arose from the original introduction. On the basis of the original description and figure of this species, a recent collection from the Gulf coast of southern Mexico (*H. E. Moore 6270*) has been identified as *S. ortgiesii.* There are differences between specimens of *Engler 79* and the Moore collection, especially in leaf-shape, which is elliptic-oblanceolate in the latter, broadly elliptic in *Engler 79.* All the Engler specimens, however, are without inflorescences, and prevent floral comparison. The Brown collection discussed above correlates these various elements, and is florally similar to the Moore collection.

Engler and Krause (Pflanzenreich **4**^{23B}: 124. 1908) cited *Preuss 1444* (Escuintla, Guatemala) as representing this species. I have not examined that specimen; its locality suggests that it may possibly represent *S. matudae.* No specimen collected in Guatemala along the Pacific slope has been seen that may be referred to *S. ortgiesii.*

The species seems nearly related to *S. wendlandii.* It is much larger than *S. wendlandii,* and its perianth segments are entire apically. From all others these two species are differentiated by a winged geniculum.

31. S. atrovirens Schott, Oesterr. Bot. Zeitschr. **8**: 179. 1858. Figure 7.

Leaf-blade lanceolate or oblong-lanceolate, 40–61 cm long and 15–22 cm wide, the apex acuminate, the base obtuse, the primary lateral veins many, arising at an angle of 60–70°; petiole to 42 cm or more long, alate in the lower two-thirds; geniculum 1.5 cm long. Peduncle to 50 cm or more; spathe cucullate, elongate-elliptic, 21–26 cm long and 6.7–7.5 cm wide, the apex attenuate-acuminate, the base acute and decurrent on the peduncle 5.5–10 cm; spadix 3.5–5 cm long, on a stipe 0.5–1 cm long; perianth of separate segments; pistil obpyramidal, slightly constricted between the annular style and the ovary, apically subtruncate, only the elevated stigma exceeding the perianth; ovary 3-locular, the ovules superposed, varying from 4 to 3(–2) in each of the 3 locules, totaling 12–9(–8) ovules per ovary; fruit unknown.

Type collection: *H. Pittier 9053,* "bord d'un ruisseau à San Francisco de Guadalupe, alt. 1170 cm," Costa Rica, Oct 1894 (neotype US, duplicate BR). The holotype, *Wendland 1264,* deposited at Berlin or Vienna, appears to be no longer extant, probably having been burned.

Distribution: Restricted to the Atlantic slope of the Cordillera in east central Costa Rica.

COSTA RICA: près San Francisco de Guadalupe, Mai 1893, *Pittier 7995* (BR).

This species is one of three *Spathiphyllum* species based upon Wendland collections from Costa Rica. Until the present study, *S. atrovirens* was known only from the (original) type collection. Though the type specimen appears to be no longer extant, I refer to this species two subsequent collections which agree well with the original description and with Schott's drawing (W). One of these collections is designated neotype of *S. atrovirens.*

The exact locality where Wendland collected his specimen is unknown, having been noted simply "bei Pedregal." Standley (Field Mus. Publ. Bot. **18**: 48. 1937) stated that Wendland "entered the country by the Sarapiquí Valley, and explored especially the mountain chain from Barba to Turrialba," which restricts his localities mostly to the provinces of Heredia and Cartago, on the Atlantic side of the cordillera. Standley (op. cit. 143) further stated that *S. atrovirens* was found in "Guápiles and undoubtedly in other parts of the Atlantic coast; region of San Ramón at 950 meters." Guápiles is in Limón, adjacent to the earlier-named provinces. The Pittier collections came from this same region.

S. atrovirens is closely related to *S. brevirostre,* but the spathe is longer-decurrent upon the peduncle, and the primary lateral veins of the leaf-blade arise at a wider angle than in *S. brevirostre.*

32. S. brevirostre (Liebm.) Schott, Aroid. **1**: 2. 1853. Figure 8.
Hydnostachyon brevirostre Liebm. Vid. Meddel. **1–2**: 25. 1849–1850.

Leaf-blade oblique, lanceolate to oblong, 35–41 cm long and 12–14 cm wide, commonly widest below the middle, the apex cuspidate-acuminate, the base obtuse, the primary lateral veins arising at an angle of 45–55°; petiole shorter than blade (fide Liebmann: incomplete in specimens), sometimes alate up to the geniculum; geniculum 2.3–4.5 cm long. Peduncle 1.5 or more times as long as the blade, to 66 cm long; spathe elliptic, (13–)17–23 cm long and 5–8 cm wide, the apex acuminate or subcaudate and 1.5–4 cm long, the base acute and decurrent on the peduncle 2.5–4.5 cm; spadix 3.2–7 cm long, on a stipe 0.6–1.4 cm long; perianth of separate segments; pistil shortly exceeding the perianth, constricted between the ovary and the inflated, ± annular style, crowned by the stigma; ovary 3-locular, the ovules superposed or collateral, varying from 5–3 in each of the 3 locules, totaling 12–9 ovules per ovary; fruit obovoid, rostellate; 10–9 ovules maturing (apparently); mature seeds unknown.

Type collection: *F. M. Liebmann s.n.,* "in sylvis umbrosis montanis, Cuesta de Teotelcingo, alt. 4-5000'," Oaxaca, Mexico. Jun 1842 (lectotype C.) Three collections were cited with the original description, all from the same region of Oaxaca. The lectotype most adequately represents the species.

Distribution: Limited to rainforests of eastern Oaxaca, Mexico.

MEXICO: Oaxaca: Trapiche de la Concepción, Jul 1842, *Liebmann s.n.* (C); pr. Tonaguía, Aug 1842, *Liebmann s.n.* (C); vicinity of Choápam, Jul 1894, *Nelson 906* (US).

S. brevirostre finds its closest ally in *S. atrovirens* of Costa Rica. Found at high elevations in the state of Oaxaca, it is known only from the original collections and a single subsequent one, all made in the previous century.

S. brevirostre differs from *S. atrovirens* by its more shortly decurrent spathe and the narrower angle at which the primary lateral veins arise. It appears to be allied to *S. matudae* of adjacent Chiapas and Guatemala, but the longer style of the pistil in this latter species serves to distinguish it from *S. brevirostre*.

33. S. blandum Schott, Oesterr. Bot. Wochenbl. **7**: 159. 1857. Figure 8.

Leaf-blade elliptic to oblong- or lanceolate-elliptic, 30–45(–65) cm long and (8–)11–19(–25) cm wide, commonly widest at the middle and narrowed equally toward either end, the apex and base acute-acuminate; petiole shorter than the blade, 27–37(–45) cm long, often alate up to the geniculum, the wing apically auriculate and 5–8 mm wide; geniculum 1.5–2.8(–3.2) cm long. Peduncle commonly 1½–2 times as long as the petiole, 45–70(–90) cm long; spathe typically elliptic, 12–22(–27) cm long and (3.6–)4.5–8(–9.8) cm wide, acuminate at each end, or varying to oblong and sometimes oblanceolate with the apex cuspidate and 1.5–3 cm long, the base acute or obtuse and finally attenuate, decurrent on the peduncle (often obliquely) 2–5.5(–8.5) cm; spadix (3–)4.5–11(–14) cm long, sessile or on a stipe 1(–2) cm long; perianth of separate segments; pistil elongate-conic, the exserted portion equaling or longer than the perianth; ovary (2–)3-locular, the ovules collateral, varying from 3 to 1 in each of the 3 locules, totaling 8–4 ovules per ovary; fruiting spadix tuberculate, the fruit to 10.5 mm long, obovoid, rostrate; seeds 7–3, oblique-reniform-ovoid to oblong in profile, their inner faces flat and smooth, the outer face rounded, smooth to slightly verruculose between the vertical rows of foveola.

Type: the original description [Int. Code Bot. Nomencl. (1956) Art. 10, note]. Schott described this species from a living plant in cultivation. Apparently no type specimen was preserved. An excellent representative specimen of *S. blandum* is *J. D. Smith 1534* (G, GH, US).

Distribution: Widespread in wet situations along coast of the Gulf of Honduras in British Honduras, Guatemala, and Honduras, extending deep into the interior of Guatemala.

BRITISH HONDURAS: Belize District: Manatee, B. H. Bot. Station, *Campbell 67* (K); Gracie Rock, Sibun R., Mar 1935, *Gentle 1600* (MICH, NY); Gracie Rock, Sibun R., Jul 1935, *Gentle 1698* (MICH). El Cayo Dist.: San Antonio, Mai 1931, *Bartlett 13022* (MICH); Water Hole near Vaca, Apr 1938, *Gentle 2464* (GH, MICH); Roaring Creek, Aug 1929, *Lundell 452* (F); Valetin, Jun–Jul 1936, *Lundell 6195* (MICH), *7020* (MICH). Stann Creek Dist.: Big Creek, Mai 1929, *Schipp 252* (BM, F, G-DEL, GH, NY, S, US); Middlesex, *Schipp 252* (MICH, MO). Toledo Dist.: Jan 1907, *Peck 626* (GH, K).

GUATEMALA: Sutzebal, *Owen 10* (US). Alta Verapaz: near Finca Sepacuité, Mar 1902, *Cook & Griggs 65* (US); Chamá, Aug 1920, *Johnson 470* (US); vicinity of Secanquim, Apr 1905, *Pittier 186* (US); near Chirriacté on Petén highway, Apr 1941, *Standley 91640* (F); along Río Polochic below Tamahú, Apr 1941, *Standley 91991* (F); Cerro de Agua Tortuga (Sahacoc), vic. of Gubilguitz, Mar 1942, *Steyermark 44597* (F); between Samanzana and Candelaria, via Seboquil, Mar 1942, *Steyermark 45102* (F); Gubilguitz, Mar 1902, *von Tuerckheim 8331* (US); Gubilquitz, Jul 1903, *von Tuerckheim 8471* (GH, US); Gubilguitz, Aug 1907, *von Tuerckheim 355* (US); Cobán, Aug 1907, *von Tuerckheim 356* (US); eastern portions of Vera Paz & Chiquimula, 1885, *Watson 179* (GH). Huehuetenango: vicinity of Maxbal, ca. 17 miles n of Barillas, Sierra de los Cuchumatanes, Jul 1942, *Steyermark 48734* (F, NY). Izabal: Los Amates, Feb 1905, *Deam 105* (GH, MICH, NY, US); Quiriguá, Jul 1938, *Johnston 1262* (F); Río Dulce, Mar 1889, *J. D. Smith 1534* (G-DEL, GH, US); vicinity of Quiriguá, Mai 1922, *Standley 23773* (US), *24110* (US); Manicaria swamp near Pto. Barrios, Apr-May 1939, *Standley 72801* (F), *72808* (F); Escoba, across the bay (west) from Pto. Barrios, Mai 1939, *Standley 73004* (F); between Bananera and "La Presa" in Montaña del Mico, Mar 1940, *Steyermark 38278* (F); Dec 1941, *Steyermark 41906* (F).

HONDURAS: Puerto Sierra, Feb 1903, *Wilson 581* (NY). Atlántida: Coyol, Aug 1923, *Carleton 507* (US); Lancetilla Valley near Tela, Jun–Jul 1929, *Chickering 166* (MICH), *193a* (MICH), *210* (MICH); vicinity s of San Alejo, near Río San Alejo, *Standley 7730* (F); Lancetilla Valley near Tela, Dec 1927–Mar 1928, *Standley 52995* (F, US), *53099* (US), *53108* (F, US), *55781* (F, US); vicinity of Tela, Dec 1927–Mar 1928, *Standley 54520* (F, US); hills above Lancetilla, Jul 1934, *Yuncker 4631* (F, MICH, MO), *4729* (F, MICH, MO); near Lancetilla, Aug 1934, *Yuncker 5007* (F, MICH, MO); foothills back of La Ceiba, Jul 1938, *Yuncker, Koepper, & Wagner 8225* (F, GH, NY). Santa Bárbara: San Pedro Sula, Apr 1888, *Thieme 306* (U.S. 5528) (US). Yoro: Quebrada Seca, Dec 1927, *Standley 53902* (F, US).

CULT.: *Engler 65* (B, C, G-DEL, GH, L, P, US); "Serre du Rivage, 1853" (G); "Aug 1858," annotated by Schott, Herb. Hook. (K); [spec. in Herb. Hook., without data, annotated by Schott apparently (K)].

It is not known by what means *S. blandum* found its way into European gardens, and its country of origin remained unknown before this investigation. Engler (DC. Monogr. Phan. **2**: 224. 1879) incorrectly referred to *S. blandum Wullschlaegal 1766* (Bluefields, Mosquito), which he considered to have been collected in Suriname. Jonker and Jonker (Fl. Suriname **1**: 28. 1953) first recognized that that locality is not in Suriname. They were wrong, however, to suggest that it might be in Jamaica, since no species of *Spathiphyllum* is indigenous to the Antilles. Along the Caribbean coast of southern Nicaragua is the locality "Bluefields, Mosquito;" *S. friedrichsthalii* is native in that region. Though Wullschlaegal is not listed as having visited Nicaragua, it is possible that the ship on which he traveled to Europe in 1855 made a stop on the Mosquito coast before leaving the hemisphere, or possibly the specimen reached him from some other source.

There appears to be a progressive increase in the size of plants of *S. blandum* from British Honduras southeastward to the Lancetilla Valley of Honduras, where the species reaches its maximum stature. It shows little variation, however, other than in size.

S. blandum typically has the leaf-blade widest at the middle and narrowed nearly equally toward either end, while in *S. phryniifolium* the leaf-blade tends to be widest below the middle and the base of the blade is obtuse. The absence of a wing upon the geniculum separates *S. blandum* from *S. ortgiesii* and *S. wendlandii*.

34. S. lanceaefolium (Jacq.) Schott, Melet. Bot. 22. 1832. Figure 5.

Dracontium lanceaefolium Jacq. Collectanea **4**: 118. 1790.
Massowia lanceaefolia C. Koch, Bonplandia **4**: 12. 1856.

Leaf-blade oblong- or elliptic-lanceolate, more than 30 cm long and ca. 10 cm wide, the apex acuminate, the base (apparently) acute, the many primary lateral veins arising at an angle of 45–55°; petiole shorter than or equaling the blade, alate nearly to the base of the geniculum; geniculum ca. 1.5 cm long. Peduncle somewhat longer than the petiole; spathe oblong-lanceolate, ca. 15 cm long and 5 cm wide, the apex acuminate-cuspidate, the base (apparently) acute, decurrent on the peduncle ca. 2 cm; spadix 3–4 cm long, on a stipe ca. 1 cm long; perianth segments separate or possibly conglutinate, green at the apex; pistil elongate-conic, exceeding the perianth, the locules of the ovary 2-ovulate.

Type: Jacquin, Ic. Pl. Rar. **3**: *pl. 612* (1786–1793). This is an excellent color plate, with enlargements of a single flower. The original description states that the flowers have five perianth segments, although the plate suggests that they have only four. Since all the segments are not of the same size, it is possible that two more segments would be hidden behind the pistil in that illustration. The holotype, *Bredemeyer s.n.*, collected near Caracas, was probably burned at Vienna or Berlin.

The description presented above was drawn from the Jacquin plate and from the descriptions of various writers who probably examined the Bredemeyer specimen.

S. lanceaefolium has remained an unfamiliar species, known only from the type collection. Now the type specimen has been destroyed. No specimens have been identified as *S. lanceaefolium* during this investigation. *Sagot 769* was referred to this species by other workers, but its non-decurrent spathe and the characteristics of its pistil lead me to identify that specimen unquestionably as *S. humboldtii*.

Despite the lack of representative specimens, Jacquin's description and fine illustration of *S. lanceaefolium* serve adequately to define the genus *Spathiphyllum*, and consequently to save the generic name. It is noteworthy that an illustration of this species presented by Schott (Aroid. **1**: 2. *pl. 3B*. 1853) is not in complete agreement with that of Jacquin, lending more uncertainty to the exact character of *S. lanceaefolium*. The differences between the illustrations are compared below.

Jacquin	Schott
Specimen flowering	Specimen fruiting
Stipe ca. 1 cm long	Stipe longer
Spathe oblong-lanceolate	Spathe elliptic-lanceolate
Style blunt-rounded	Style attenuate

This species appears to be closely related to three other species. The acute base of the leaf-blade distinguishes *S. lanceaefolium* from both *S. kochii* and *S. phryniifolium*, in which the leaf-blade is obtuse at the base. Differences between *S. lanceaefolium* and *S. blandum* are uncertain. In the absence of definitive material of *S. lanceaefolium*, and considering their different geography, I have continued to recognize each as a species.

35. S. kochii Engl. & Krause, Pflanzenreich **4**^{23B}: 123. 1908. Figure 5.

Leaf-blade elliptic-lanceolate to elliptic, 2–3 times as long as wide, 30–49 cm long and 10–20 cm wide, the apex acuminate-cuspidate, the base obtuse to subrotund, the many pairs of primary lateral veins arising at an angle of ca. 45°; petiole 18–50 cm long, alate in the lower half or more; geniculum 1.5–2.6 cm long. Peduncle to 60(–70) cm long; spathe elliptic-lanceolate or elliptic, 14–30 cm long and 5–10 cm wide, the apex long-attenuate, the base acute and decurrent on the peduncle 1.5–6 cm; spadix 3–6.8(–9) cm long, on a slender stipe 1.5–3(–4) cm long; perianth of separate segments, drying very light-colored; pistil slender-conic, the style long-exserted above the perianth, drying dark-colored, ending in the blunt stigma; ovary 3-locular, the ovules affixed near the base of the locules, 2–1 in each of the 3 locules, totaling 6–3 ovules per ovary; fruiting spadix rough; fruit obovoid, rostrate; seeds 3 or less, oblique-ovoid, the surface smooth between the ± vertical rows of foveola.

Type collection: *Engler 173* (Herb. No. 38) (lectotype P, isotypes B, G-BOIS, G-DEL, GH, K, L, M, P, US). The type collection was made from plants cultivated at the botanical garden of the University of Kiel.

Distribution: Rainforests of the Caribbean coast west of Caracas, Venezuela, and possibly in central Colombia.

COLOMBIA: Caparrapí, Cundinamarca, Jun 1939, *Garcia B. 7676* (COL), *7689* (COL, US); (?) La Balsa, Quindío Mts., ese of Cartago, El Valle, 1844, *Goudot s.n.* (P).

VENEZUELA: above Guamitas, Parque Nacional, Aragua, Dec 1938, *Alston 5812* (NY); en selva pluvial a Barburata, Carabobo, Feb 1942, *Tamayo 2211* (VEN); El Hacha, Falcón, 1906, *Brown s.n.* (K); Maracay, Aragua, 1928, *Vogl 822, 823* (M).

S. kochii was poorly understood until the present study. The name is nowhere found in floras, and scarcely at all in the literature of cultivated plants. The epithet was applied by Birdsey (Cult. Aroids 118. 1951) to the cultivated plant (often known as *S.* "clevelandii") that I identify as *S. wallisii.*

Engler and Krause described *S. kochii* to accomodate a plant growing in the botanical garden at Berlin, under the name "S. lanceolatum C. Koch," specimens[13] (*Engler 173*) of which had earlier been distributed to other herbaria under that name. Comparison of those specimens with the type of *S. lanceolatum* revealed that they were not conspecific. Specimens of *Engler 173* then became the type of *S. kochii.*

Engler keyed out *S. kochii* on the basis of its 4–2-ovulate locules, and its crisped-undulate leaf-margins. This ovary characteristic is misleading, since there exists but a single, aberrant specimen [*Engler 173* (B)] with four ovules per locule, and the flowers of that specimen were either two- or four-locular! All other specimens of *Engler 173* have one or two ovules in each of the three locules. The Berlin sheet is the only specimen of *S. kochii* that bears its authors' annotation label. It appears, however, that the plate of *S. kochii* distributed by Engler was prepared from the Paris sheet of *Engler 173.* This latter specimen best represents the species, and is designated lectotype of *S. kochii.*

The original description names only tropical America as the native area of this species. Until the present study, no collections from the wild had been identified as *S. kochii.* Among the material examined is a distinct species from coastal Venezuela that agrees well with the type of *S. kochii.* Two anomalous collections from Columbia are tentatively referred here, and though they are geographically disjunct from the Venezuelan representatives, they vary little more than the specimens of *Engler 173* that were presumably taken from plants of identical origin. Related to this taxon is *Goudot 1844,*[14] but this doubtfully represents *S. kochii,* and may prove to be an undescribed species. This latter specimen was never before annotated or cited.

S. kochii is closely allied to *S. lanceaefolium,* and there is some basis for joining these under a single specific epithet. In the absence of definitive material of *S. lanceaefolium,* it seems wise to recognize *S. kochii* as an independent species. It shows a tendency toward a broader leaf-blade; the base of the blade is obtuse rather than acute, and the stipe of the spadix is much longer than that of *S. lanceaefolium.*[15]

---

[13] These specimens were later amplified by the addition of a plate illustrating *S. kochii.*

[14] Not considered in preparation of the description of this species.

36. S. phryniifolium Schott, Oesterr. Bot. Wochenbl. **7**: 159. 1857. Figure 7.

Spathiphyllum zetekianum Standl. Ann. Missouri Bot. Gard. 27: 267. 1940.

Leaf-blade oblique, typically lanceolate, 2.5–4 times as long as wide, varying to oblong-elliptic, 25–50(–67) cm long and (5–)8–16(–20) cm wide, the apex acuminate-cuspidate, the base obtuse to subtruncate, the primary lateral veins many, arising at an angle of ca. 60°; petiole subequaling the blade, conspicuously alate nearly or quite to the geniculum; geniculum 1–3 cm long. Peduncle 1.5 times to twice as long as the blade, 35–65(–103) cm long; spathe cucullate, typically lanceolate, varying to oblong-elliptic, 10–26(–33) cm long and 3–9(–11) cm wide, the apex attenuate, the base oblique, subtruncate to cuneate and decurrent on the peduncle 2–4.5(–7) cm; spadix 2.5–8(–11.5) cm long, on a stipe 0.4–1.3(–2) cm long; perianth of separate segments; pistil elongate-conic, the exserted portion shorter than the perianth; ovary (2–)3-locular, the ovules affixed near the base of the locules, 2–1 in each of the 3 locules, totaling 6–3(–2) ovules per ovary; fruiting spadix rough; fruit obovoid, rostellate; seeds as many as the ovules, oblique-ovoid or reniform to oblong in profile, the surface smooth or somewhat foveolate.

Type collection: *A. Fendler 425*, "Chagres, Isthmus of Panama," mouth of the Río Chagres, Canal Zone, Panama, Jan 1850 (holotype K). Unicate, presumably.

Distribution: Widespread in Panama including the Perlas Archipelago, extending northward to Chiriquí Lagoon on the Caribbean coast and reaching the western Costa Rican province of Guanacaste.

COSTA RICA: Guanacaste: La Tejona, n of Tilarán, *Standley & Valerio 46032* (US).

PANAMA: Bocas del Toro: Water Valley, Sep 1940, *von Wedel 933* (F); Old Bank Island, vic. of Chiriquí Lagoon, Feb 1941, *von Wedel 2068* (MO); Shiphead Island, vic. of Chiriquí Lagoon, Sep 1941, *von Wedel 2688* (F, MO), *2690* (MO). CANAL ZONE: Agua Clara Reservoir, Sep 1924, *Stevens 556* (US); Barro Colorado Island: Jun 1931, *Bailey & Bailey 122* (BH), *209* (BH); Snyder-Molino Trail, Jul 1931, *Starry 4* (F); Zetek Trail, Jul 1931, *Starry* 27 (F) (type collection of *S. zetekianum* Standl.); Aug 1940, *Woodson & Schery 968* (MO); back of second cone e of Peña Blanca, Feb 1932, *Woodworth & Vestal 681* (F). Chiriquí: El Boquete, Mar 1918, *Killip 3639* (US). Coclé: n rim of El Valle, June 1939, *Alston & Allen 1850* (MO). Darién: Cana-Causi Trail, Chepigana Dist., Mar 1940, *Terry & Terry 1525* (F). Panamá: Cerro Campana, Dec 1939, *Allen 2090* (MO); Cerro Campana, trail from Campana to Chica, Aug 1941, *Allen 2655* (F). PERLAS ARCH.: "Perl-oarne," 1852, *Andersson s.n.* (S). San José Island: coastal bluffs at Naval Station, Jun 1945, *Erlanson 353* (GH, US); Camp Valley, Oct 1944, *Johnston 265* (GH); center of Area 11D (trail from Loop), Jan 1946, *Johnston 1164* (GH); north of Navy Station, at pump, Jan 1946, *Johnston 1264* (GH). Veraguas: trail between Cañazas and foot of Cordillera Central, headwaters of Río Cañazas, Feb 1937, *Allen 203* (MO, UC).

S. phryniifolium is restricted to Costa Rica and Panama, but various authors have included it in the floras of countries from Mexico to Peru! It is often confused with *S. friedrichsthalii,* which occurs in the same region as *S. phryniifolium.* The most positive difference between these two species is the number of ovules per locule—two or one in *S. phryniifolium,* and commonly 8–5 in the other. *S. friedrichsthalii* is further differentiated by its very stout, densely flowered spadix and the long-exserted styles.

---

[15] According to the original description and illustration of *S. lanceaefolium* by Jacquin.

Standley (Field Mus. Publ. Bot. **18**: 143. 1937) apparently followed Engler (Pflanzenreich **4**^{23B}: 125. 1908) in citing the range of this species to include Guatemala, and in 1944 (Ann. Missouri Bot. Gard. **31**: 36) wrote: "The writer strongly suspects that *S. phryniifolium* is a synonym of *S. friedrichsthalii*, and certainly the differences suggested for separating the two species are not convincing." This opinion is contrary to my observations. Standley then illustrated *S. friedrichsthalii* from *Allen 203*, a collection with biovulate locules which, although slightly aberrant in appearance, possibly represents *S. phryniifolium*. He did not cite this collection under either species! Despite the alleged lack of difference between the two species, Standley continued to accept his earlier-described *S. zetekianum*, which I consider to be only a very young plant, possibly of *S. phryniifolium*.

The specimens that agree most closely with the type collection are from isolated areas—the off-shore Perlas Archipelago in the Gulf of Panama, and the distant Costa Rican province of Guanacaste, some 200 miles to the west of the type locality. The collections from the Canal Zone and from intermediate points show some variation from the typical form, with leaves proportionally a little wider. There are indications that a smaller form may occur in some intermediate localities. Nonetheless, there seems little doubt that the specimens referred to *S. phryniifolium* represent one fairly uniform species.

The type specimen of *S. zetekianum* (*Starry 27*) is obviously a juvenile plant. Its oldest leaf and the flowers approach the form found in this species. *Killip 3639*, with its narrow leaves, may be non-representative of this taxon, and *Terry 1525* is questionably referred here; yet the uniovulate locules of their ovaries furnish a sound basis for referring them to *S. phryniifolium*.

The possible conspecificity of this species and *S. lanceaefolium* has been considered. Since the latter species is incompletely known, each is recognized as a separate taxon.

EXCLUDED OR DUBIOUS NAMES

Leucochlamys callacea Poepp. ex Engl. in DC. Monogr. Phan. **2**: 230. 1879, nomen, as synonym of *Spathiphyllum cannaefolium*.

Massowia marginata C. Koch ex Ender. Index Aroid. 53. 1864, nomen; = *Spathiphyllum cochlearispathum?*

Pothos odorata Anderson ex Dryand. Bot. Mag. **17**: *pl. 603*. 1803, nomen, as synonym of *Spathiphyllum cannaefolium*.

Spathiphyllum beccari Engl. Bul. Soc. Tosc. Ortic. **4**: 268. 1879; = *Holochlamys beccarii* Engl. Becc. Malesia **1**: 265. 1883.

S. caudatum Poepp. & Endl. Nova Gen. Sp. Pl. **3**: 85. *pl. 296*. 1845; = *Urospatha caudatum* (Poepp. & Engl.) Schott, Aroid. **1**: 3. *pl. 8*. 1853.

S. × hybridum N. E. Br. (*S. cannaefolium* × *S. patinii*) Ill. Hortic. **29**: 75, 76. 1882. Originated in cultivation; its persistence today is unknown.

S. marginatum C. Koch, Bonplandia **4**: 12. 1856, nomen; = *S. cochlearispathum* ?

S. pictum Bull, Catalogue 13, with pl. 1874; = ?

S. pictum Nichols, Dict. Gard. **3**: 467. 1887; = *Rhodospatha picta* Nichols ?

S. sagittifolium Schott, Melet. Bot. **1**: 22. 1832; = *Urospatha sagittaefolium* Schott, Aroid. **1**: 4. 1853.

S. sagittaefolium Spruce ex Engl. in DC. Monogr. Phan. **3**: 279. 1879, nomen, as synonym of *Urospatha spruceanum* Schott, Bonplandia **5**: 128. 1857.

S. wallisii Hort. Veitch. Gard. Chron. II. **3**: 558. 1875; = *Stenospermatium popayenense* Schott var. *wallisii* (Mast.) Engl. in Pflanzenreich **4**^{23B}: 88. 1908.

INDEX TO EXSICCATAE

numbers in parenthesis refer to species

Allen, P. H. *203* (36); *855* (24); *861* (24); *2090* (36); *2655* (36).
Alston, A. H. G. *5812* (35)
Alston, A. H. G. & Allen, P. H. *1850* (36).
Anderson, M. *s.n.* (1).
Andersson, N. J. *s.n.* (36).
André, E. *1175* (1).
Appun, C. F. *230* (7); *848* (7).
Araque, M. J., & Barkley, F. A. *18M011* (1); *19Ch049* (24).
Arbeláez, E. P. *31* (1); *710* (1).
Archer, W. A. *1796* (24); *2333* (1); *8204* (23).
Ariste-Joseph, Bro. *A924* (14).
Aristeguieta, L. *1601* (1).
Aviles, S. *48* (24).
Bailey, L. H. *550* (28); *552* (25).
Bailey, L. H. & Bailey, E. Z. *122* (36); *209* (36); *271* (24).
Bangham, W. H. *567* (24).
Bartlett, A. W. *8745* (1).
Bartlett, H. H. *13022* (33).
Beckett, J. E. & Kortright, P. *8487* (7); *8502* (1).
Bloembergen, S. *4117* (2).
Bourgeau, E. *2215* (25); *3261* (25).
Brahe, C., Araque, M. J., & Barkley, F. A. *18C701* (24).
Bredemeyer, F. *s.n.* (34).
Brenes, A. M. *22626* (29).
Brink, R. C. B. van der *1217* (2); *1983* (2).
British Guiana Forest Department *2976* (7); *3904* (7); *3909* (7).
Britton, N. L. & Hazen, T. E. *237* (1).
Broadway, W. E. *7082* (1); *7371* (1); *9189* (1).
Brown, N. E. *s.n.* (14); *s.n.* (17); *s.n.* (25); *s.n.* (28); *s.n.* (30).
Brown, T. W. *s.n.* (35).
Camp, W. H. *1005* (1); *E-1069* (22).
Campbell, E. J. F. *67* (33).
Cantonspaark, Hort. *3393* (14).
Cardona, F. *585* (1).
Carleton, M. A. *507* (33).
Carlson, M. C. *2126* (25).
Castañeda, R. R. *4860* (4).
Chickering, A. M. *35* (24); *166* (33); *193a* (33); *210* (33).
Cook, O. F. & Doyle, C. B. *425* (29).
Cook, O. F. & Griggs, R. F. *65* (33).
Copeland, E. B. *1263* (2).
Cowell, J. F. *54* (24).
Croizat, L. *459* (1); *697* (1).
Cruz, J. S. de la *1026* (7); *1121* (1); *2940* (7); *3128* [NY] (1); *3128* [F, GH, US] (7); *3610* (7); *4095* (1).
Cuatrecasas, J. *3843* (1); *3844* (1); *3844b* (1); *4540* (1); *7369-A* (1); *8927* (1); *10665* (16); *10861* (1); *11055* (1); *13097* (1); *14217* (24); *15969* (24); *16366* (24).
Cuming, H. *s.n.* (2).
Curran, H. *364* (2).
Curran, H. M. *226a* (10); *226b* (1).
Daniel, H. *4947* (24).
Davis *152* (5).
Davidson, M. E. *565* (29).
Dawe, M. T. *279* (1).
Dawson, E. Y. *15135* (6).
Deam, C. C. *105* (33).
Dodge, C. W. & Goerger, V. F. *9414* (24); *9499* (24).
Dryander, E. *2589* (24).
Ducke, A. *7325* (1).
Ebalo, L. E. *699* (2).
Edaño, G. *41835* (2); *76170* (2).
Elmer, A. D. E. *7540* (2).
Engler, A. *17* (25); *65* (33); *79* (30); *82* (14); *173* (35); *229* (17).
Erlanson, C. O. *353* (36).
Ewan, J. A. *16791* (1).
Eyma, P. J. *1544* (2); *1709* (2); *2385* (2); *3367* (2); *3548* (2); *3822* (2).
Famayo, F. *2211* (35).
Fendler, A. *425* (36); *426* (24); *747* (1).
Fernandez, A. *273* (24); *2091* (1).
Forchez *s.n.* (2).
Friend, E. A. *142* (1).
Fróes, R. L. *21187* (1).
Furtado, C. X. *s.n.* (17).
Garcia, B., H. *7676* (35); *7689* (35).
Gardner, G. *1867* (6); *1868* (6).
Gentle, P. H. *1600* (33); *1698* (33); *2464* (33).
Gines, H. *1920* (1).
Glaziou, A. F. M. *10126* (23).
Gonggrijp, J. W. & Stahel, G. *5* (23).
Goudot, J. *s.n.* (35?).
Graham, E. H. *310* (7).
Grant, M. L. *9942* (1).
Haught, O. *1271* (14); *1367* (9); *1386* (14); *1894* (8); *1895* (15); *4598* (24).
Hayes, S. *82* (24); *96* (24); *533* (24); *539* (24).
Heyde & Lux *4655* (26).
Hermann, F. J. *11052* (1).
Hitchcock, A. S. *17235* (7); *17570* (1).
Holm, R. W. & Iltis, H. H. *795* (24).
Holt, E. G. & Blake, E. R. *724* (1).
Hooker, Dr. *s.n.* (7).
Hostmann, F. W. *1154* (23).
Huber, J. *1403* (23).
Humboldt, A. von & Bonpland, A. *397* (1).
Idrobo, J. M. *494* (1).
Idrobo, J. M. & Schultes, R. E. *593* (1); *741* (1); *1031* (1).
Im Thurn, E. F. *1952* (1).

Jaramillo, R., Mesa, D., Idrobo, J. M. & Fernandez, A. *318* (1); *321* (1); *420* (1).
Jenman, G. S. *1625* (1); *1952* (1); *1985* (7); *3577* (1); *6868* (7); *6989* [NY] (1); *6989* [K] (7).
Johnson, H. *470* (33).
Johnston, I. M. *265* (36); *1164* (36); *1264* (36).
Johnston, J. R. *30* (1); *1262* (33).
Kalbreyer, W. *832* (1); *1354* (14); *1413* (8); *1414* (14).
Karwinski, W. F. von *s.n. (273)* (25); *s.n. (274)* (25).
Kauderns, W. *11* (2).
Kenoyer, L. A. *195* (24).
Kerber, E. *7B* (25).
Killip, E. P. *3639* (36); *5034* (24); *34258* (1); *35076* (24); *35275* (24); *40037* (24).
Killip, E. P. & Cuatrecasas, J. *38859* (24).
Killip, E. P. & Garcia, H. *33397* (24).
Killip, E. P. & Smith, A. C. *26153* (20); *26157* (16); *26565* (16); *26752* (16); *28775* (1).
Kjellberg, G. *s.n.* (2).
Klug, G. *1663* (1); *2981* (1).
Koorders, S. H. *495* (2); *3543* (2); *3545* (2); *15898β* (2); *16144β* (2); *16145β* (2); *16148β* (2).
Kuntze, O. *608* (1).
Kupper, W. *581* (24).
Lambert, V. *s.n.* (15).
Landeman, C. *5794* (1).
Langlassé, E. *2* (24); *s.n.* (2).
Lawrence, A. E. *696* (14).
Lechler, W. *2338* (9).
Lehmann, F. C. *R1* (24); *K375* (24); *563* (27); *5361* (24); *5361a* (15); *7590* (4); *7757* (14); *7758* (14).
Leng, H. *49* (7); *353* (7).
Leprieur *1839* (23).
Lewis, M. *s.n.* (26).
Liebmann, F. M. *s.n. (M41A)* (25); *s.n. (M41B)* (25); *s.n. (M41C)* (25); *s.n. (M41D)* (25); *s.n. (C41E)* (25); *s.n. (CT642)* (32); *s.n. (TC742)* (32); *s.n. (T842)* (32).
Lockhart, D. *s.n.* (1).
Loher, A. *13599* (2).
Long, L. E. *47* (24).
Luetzelburg, P. von *23873* (1); *23969* (1); *25842* (6).
Lundell, C. L. *452* (33); *6195* (33); *7020* (33).
Maguire, B. & Fanshawe, D. B. *32469* (11).
Maguire, B. & Politi, L. *28751* (1); *28751b* (18).
Maguire, B., Wurdack, J. J. & Bunting, G. S. *36689* (23); *36797* (13); *36799* (13).
Maraval *777* (1).
Markgraf *3865* (23).
Matuda, E. *2742* (26); *3136* (25); *16561* (26); *17013* (26); *17645* (26); *18022* (26).
Maxon, W. R. *4821* (24).
McGregor, M. C. *189* (2); *47379* (2).
Mendoza, D. R. *18160* (2).
Merrill, E. D. *4080* (2); *5486* (2).
Molina, R. A. *2083* (24); *2412* (24).
Moore, C. E. *13* (24).
Moore, H. E. *6270* (30).
Nelson, E. W. *906* (32).
Owen, Mrs. Wm. *10* (33).
Pachero, C. *93* (29).
Parker, C. S. *s.n.* (7).
Peck, M. E. *626* (33).
Pennell, F. W. *1599* (1).
Persaud, A. C. *269* (7).
Philipson, W. R., Idrobo, J. M. & Fernandez, A. *1583* (1).
Pittier, H. *186* (33); *4122* (24); *4724* (4); *7995* (31); *9053* (31); *12370* (3); *16244* (3).
Poiteau, A. *s.n.* (23).
Posthumus, O. *2480* (2).
Purpus, C. A. *10781* (25); *16445* (25).
Rachmat *559* (2).
Ramos, M. *15385* (2); *23574* (2).
Ramos, M. & Edaño, G. *28523* (2); *33596* (2); *36810* (2); *40704* (2).
Reed, E. *916* (1).
Reko, B. P. *4092* (25).
Riley, L. *216* (1).
Robinson, C. B. *6476* (2).
Rusby, H. H. & Squires, R. W. *115* (1).
Sagot, P. A. *769* (23).
Salvin, O. *s.n.* (26).
Sandwith, N. Y. *153* (7).
Santini *7773* (23).
Schack, Baron de *s.n.* (1).
Schiefer, H. *792* (1).
Schipp, W. A. *252* (33).
Schomburgk, R. H. *s.n.* (12).
Schott, A. C. V. *3* (24).
Schultes, R. E. *12130* (1).
Schultes, R. E. & Cabrera, I. *13107* (1); *13975* (1); *17452* (1); *19044* (1); *19340* (1); *19523* (1).
Schultes, R. E. & Lopez, F. *10217* (1).
Seeman, B. C. *s.n.* (24).
Seibert, R. J. *507* (4).
Shank, P. J. & Molina R., A. *4173* (24).
Shattuck, O. *581* (24).
Sherring, R. V. *3577* (1).
Shimek, B. & Smith, C. L. *420* (24).
Skutch, A. F. *3033* (29).
Smith, A. *H337* (29); *857* (29); *927* (29).
Smith, F. D. *236* (1).
Smith, J. D. *1534* (33); *2241* (26); *2790* (26); *6817* (29).
Sprague, T. A. *121* (1).
Spruce, R. *4496* (9).

Standley, P. C. *7730* (33); *20166* (26); *23773* (33); *24110* (33); *37350* (29); *47636* (26); *52995* (33); *53099* (33); *53108* (33); *53902* (33); *54520* (33); *55781* (33); *66857* (26); *68204* (26); *68231* (26); *72801* (33); *72808* (33); *73004* (33); *78162* (26); *79067* (26); *79070* (26); *86896* (26); *86905* (26); *86966* (26); *89241* (26); *89292* (26); *89602* (26); *91640* (33); *91991* (33).

Standley, P. C. & Valerio *44088* (29); *46032* (36); *48861* (24); *49023* (24).

Starry, D. E. *4* (36); *27* (36).

Stevens, F. L. *556* (36).

Steyermark, J. A. *33202* (26); *37352* (26); *38278* (33); *41906* (33); *44597* (33); *45102* (33); *48734* (33); *56711* (1); *57669* (1); *57926* (1).

Steere, W. C. *1592* (25).

Stewart, A. *278* (3).

Sulit, M. D. & Flores, C. *31119* (2).

Surinam Forest Bureau *1133a* (23).

Tate, G. H. H. *390* (1).

Terry, M. E. & Terry, R. A. *1525* (36).

Tessman, G. *4837* (21).

Thieme, C. *306* (33).

Thompson, C. H. *10* (28).

Tonduz, A. *9398* (29); *9399* (29).

Triana, J. J. *693* (4); *696* (14); *s.n.* (24); *s.n.* (1).

Tuerckheim, H. von *355* (33); *356* (33); *8331* (33); *8471* (33).

Ule, E. *6851* (19); *6851b* (19).

United Fruit Co. *291* (24).

Uribe, U. L. *2038* (24); *2088* (1); *2089* (1).

Vogl, Pater C. *822* (35); *823* (35).

Vriese, G. H. de & Teijsmann, J. E. *s.n.* (2).

Wagner, M. *591* (24).

Watson, S. *179* (33).

Wedel, H. von *820* (24); *933* (36); *1360* (24); *1506* (24); *2068* (36); *2198* (15); *2688* (36); *2690* (36); *2979* (24).

Weir, J. *55* (15).

Wenzel, C. A. *235* (2).

Williams, L. *1706* (1).

Wilson, P. *581* (33); *01561* (2).

Wisse, C. A. *99* (2).

Woodson, R. E., Allen, P. H. & Seibert, R. J. *1912* (24).

Woodson, R. E. & Schery, R. W. *968* (36).

Woodworth, R. H. & Vestal, P. A. *656* (24); *681* (36).

Wullschlaegel, H. R. *1766* (24).

Wurdack, J. J. *347* (1).

Wurdack, J. J. & Monachino, J. V. *40986* (1); *41056* (5).

Yuncker, T. G. *4631* (33); *4729* (33); *5007* (33).

Yuncker, T. G., Koepper, J. M. & Wagner, K. A. *8225* (33).

Zetek, J. *Z-4320* (24).

INDEX TO SCIENTIFIC NAMES

Synonyms are printed in italic

- Amomophyllum [sect.] 17

- *Amomophyllum* 9
  - *floribundum* 25
  - *patini* 29

- *Anthurium candidum* 29
  - *dechardi* 12
  - *floribundum* 25
  - *patini* 29

- Dysspathiphyllum [sect.] 33

- *Dracontium lanceaefolium* 46

- *Hydnostachyon* 9
  - *brevirostre* 44
  - *cochlearispathum* 37
  - *longirostre* 37

- *Leucochlamys callacea* 50

- Massowia [sect.] 12

- *Massowia* 9
  - *cannaefolia* 12
  - *commutata* 15
  - *dechardi* 12
  - *gardneri* 29
  - *lanceaefolia* 46
  - *lanceolata* 37
  - *marginata* 50

- *Monstera cannaefolia* 12

- *Pothos cannaefolia* 12
  - *cannaeformis* 12
  - *odorata* 50

- *Spathiphyllopsis* 9
  - *minahassae* 15

- Spathiphyllum 9

- Spathiphyllum [sect.] 34
  - atrovirens 43
  - *beccari* 50
  - blandum 45
  - *bonplandii* 12
  - brevirostre 44
  - *candicans* 12
  - *candidum* 29
  - *candolleanum* 33
    - *schomburgkii* 24
  - cannaefolium 12
  - *cannaeforme* 12
  - *caudatum* 50
  - *clevelandii* 41
  - cochlearispathum 37
    - *longirostre* 37
  - commutatum 15
  - cuspidatum 20
  - *fendleri* 35
  - floribundum 25
    - *cuneatum* 25
  - friedrichsthalii 35
    - *brevifolium* 35
  - fulvovirens 27
  - *funereum* 15
  - gardneri 19
  - *glaziovii* 33
  - gracilis 32
  - grandifolium 40
  - *heliconiaefolium* 37
  - *huberi* 33
  - humboldtii 33
  - × *hybridum* 50
  - jejunum 23
  - juninense 27
  - kalbreyeri 21
  - kochii 47
  - *lacustre* 37
  - laeve 16
  - lanceaefolium 46
  - *lanceolatum* 37
  - lechlerianum 22
  - *liebmanni* 37
  - *longirostre* 37
  - maguirei 23
  - *marginatum* 50
  - matudae 38
  - *micronesicum* 15
  - *minahassae* 15
  - minor 31
  - monachinoi 19
  - neblinae 25
  - ortgiesii 42
  - patinii 29
  - patulinervum 32
  - phryniifolium 49
  - *pictum* 50
  - quindiuense 17
  - *sagittaefolium* 50
  - *sagittifolium* 50
  - schomburgkii 24
  - sipapoanum 30
  - tenerum 31
  - wallisii 40
  - *wallisii* 50
  - wendlandii 41
  - *zetekianum* 49

LIBRARY
NEW YORK
BOTANICAL
GARDEN

MEMOIRS

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME 10, NUMBER 4

The Botany of the Guayana Highland—Part IV (2)
BASSETT MAGUIRE AND JOHN J. WURDACK AND COLLABORATORS 1

Issued 15 March 1961

The Memoirs of The New York Botanical Garden are issued at irregular intervals in parts of various sizes. Approximately 500 pages will complete a volume. The subscription price of volume 10 is $10.00. Number 4 may be purchased separately for $3.50. Authors of papers may obtain separate copies of their contributions, printed at the same time as the issue, at cost price.

For further information address the editor:

H. W. Rickett
The New York Botanical Garden
New York 58, N. Y.

MAR 1961 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN 10(4):1–87

THE BOTANY OF THE GUAYANA HIGHLAND—PART IV (2)

Continued from volume 10, number 2, page 37.[1]

BASSETT MAGUIRE AND JOHN J. WURDACK
AND COLLABORATORS

AQUIFOLIACEAE

Ilex diospyroides Reiss.

The hitherto unknown male plants of this species have been collected in the lowlands adjacent to Cerro Sipapo (*Maguire & Politi 28290, 28405, 28444*), vegetatively matching closely the type collection; the plicate leaves of the Spruce material were probably due to the method of specimen preparation, since the new collections have plane-pressed leaf blades. The male inflorescences are pluri(10–20)-fasciculate in the leaf axils, 4–8(–10)-flowered, subumbelliform, with peduncles 3–8 mm long and pedicels 1 mm long. The flowers are 4-merous, with glabrous to sparsely pulverulent calyx ca. 2.5 mm in diameter and subrotund lobes ca. 1 mm in diameter which are apically sparsely papillose-ciliolate; the corolla lobes are oval, 2.1–2.3 × 1.9–2.1 mm, almost free, and glabrous.

Ilex divaricata Mart. ex Reiss.

All the natural Venezuelan savannas of the upper Río Negro drainage seem to be choice habitats for this rare species, hitherto known only from the type collection of Martius from near Manáos. We have collected it at Maroa (*36441*), Sabana El Venado (*35615*), Sabana Hechimoni (*37646, 37670*), Sabana Pacimoni (*37587, 37588, 37589*), and the Yapacana savannas (*34553, 34554*). Collections from the scrub forest near the savannas (Caño Cupueni, *36228;* Yapacana Caño, *30507, 30795, 34616*) tend to have proportionately narrower oblongish leaves as compared with the open savanna and savanna "tree island" populations; the savanna collections correspond more closely with the type collection. We strongly suspect that both *I. uleana* Loes. and *I. spruceana* Reiss. var. *guainiensis* Loes. (but not *I. spruceana* var. *spruceana*) are synonymous with *I. divaricata*, the latter seeming to correspond with the scrub forest form and the former to the savanna form; however, this tentative synonymy is based on Macbride's photographs and original descriptions and not on the necessary holotype examinations. *I. divaricata* is known also from Amazonas, Brazil (Preto, Matupiry, Rio Negro, *Froes 22815, 22843.*)

The female inflorescences of *I. divaricata* are multi (3–10)-fasciculate on the lateral spur branchlets, usually in the leaf axils, and 1-flowered. The pedicels are about 1 mm long, the four ciliolate sepals each 1 × 1.5 mm, and the petals 2 × 1.5 mm and sparsely erose-ciliolate. The fruiting pedicels are 3–5 mm long and the 2–3-seeded mature fruit ca. 7–10 mm in diameter with smooth exocarp and strongly flattened non-elevated radially striolate stigmas 1.3–1.5 mm in diameter.

---

[1] The figures in this issue are numbered consecutively with those of the first section of Part IV.

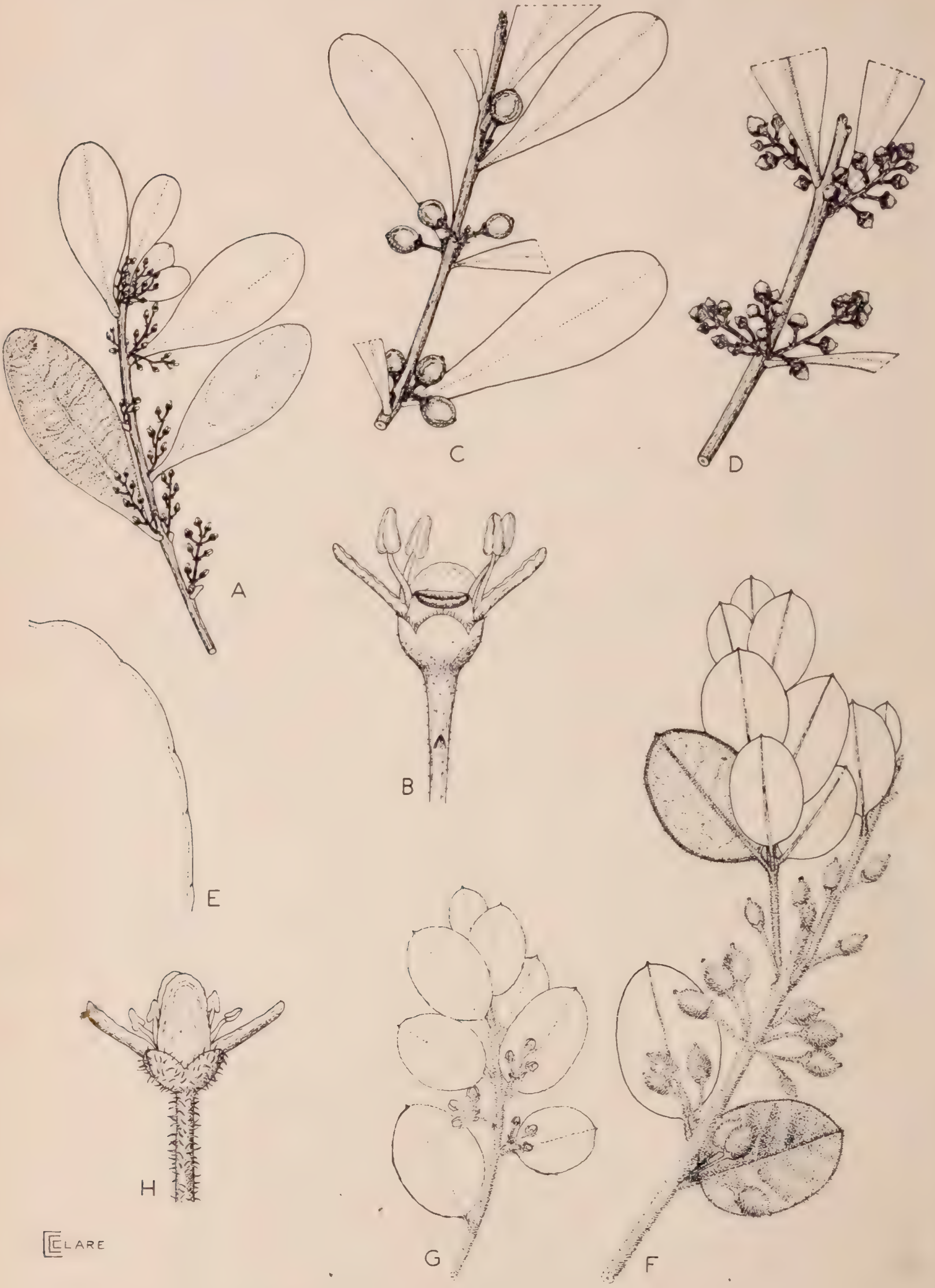


FIG. 23. A–E, *Ilex savannarum.* A, ♂ branch, × 0.75. B, ♂ flower, × 10. C, D, fruiting branchlets, × 1. E, leaf margin, × 2. F–H, *Ilex maguirei.* F, fruiting branch, × 1. G, ♂ flowering branchlet, × 1. H, ♂ flower, × 5. A, B, E from *Maguire & Wurdack 35617;* C from *Maguire, Wurdack & Keith 41823;* D from *Maguire & Wurdack 35616;* F, H from *Maguire, Wurdack & Bunting 37331;* G from *Maguire, Wurdack & Bunting 37014.*

Ilex savannarum Wurdack, sp. nov. Fig. 23, A–E.

I. retusae Kl. ex Reiss. affinis sed inflorescentiis plerumque fasciculatis et floribus racemosis.

Frutex 1–3 m. Ramuli ascendentes primum brunnei demum cinereo-brunnei glabri. Stipulae mox deciduae anguste triangulares 0.2 mm longae; petioli distincti vix evoluti 1–3 mm longi; lamina (2.5–) 4.5–6 × (1–)1.5–2.5(–3) cm anguste obovata apice rotundata vel parce retusa basi cuneata et in petiolo decurrens glabra coriacea subtus modice punctulata ad margines obscure crenato-serrulata serratulis distantibus utrinque 5–8, nervis lateralibus supra in maturitate non evolutis subtus obscure elevatis principalibus utrinque 5–7 ad margines obscure anastomosantibus. Inflorescentiae ♂ in foliorum axillis (1–)3–∞-fasciculatae racemosae 1–2 cm longae pedunculo communo nudo non evoluto singulae (3–)7–12-florae glabrae prophyllis 0.5–0.6 mm longis triangularibus acutis; pedicelli ca. 1.5(–2) mm longi; flores 4-meri; calyx ca. 1.2–1.5 mm diam. glaber lobis ca. 0.4 × 0.8 mm late rotundatis ad margines ciliolatis; corolla 1.8 mm longa ad 0.5 mm coalita; filamenta 1 mm longa; antherae 0.8 mm longae; pistillodium 1 mm diam. conicum apiculatum. Inflorescentiae ♀ ut in ♂ vel in ramulis hornotinis lateralibus foliatis vel non-foliatis singulae, racemis singulis usque ad 9-floris et ad 2 cm longis; pedicelli floriferi ca. 1.5 mm longi, fructiferi submaturi usque ad 4 mm; flores 4-meri; calyx ad anthesim ca. 1.7 mm diam. (fructiferus ca. 2.5–3.5 mm diam.), lobis 0.9 × 1.8 mm late rotundatis ad margines ciliolatis; corolla 2.2–2.3 mm longa et ad 0.5–0.6 mm coalita; filamenta 0.5 mm longa; antherae 0.5–0.6 mm longae, ovarium conicum; stigma 0.7 mm diam. vix supra ovarium elevatum; drupa sphaeroidea 5 mm diam. cum stigmate vix elevata 4-pyrena, pyrenis ca. 4 mm longis 3-gonis.

VENEZUELA: Amazonas: Río Guainía, ♂ flowers white; frequent in Sabana El Venado on left bank of Caño Pimichín above Pimichín; alt. 140 m; 14 Apr 1953, *Maguire & Wurdack 35617* (holotype, NY). *Maguire & Wurdack 35616; Maguire, Wurdack & Bunting 36349; Maguire, Wurdack & Keith 41823* (paratypes; all ♀, from Sabana El Venado).

The ♂ flowers of *I. retusa* are in 3-flowered or compound dichasia with a definite peduncle; usually the inflorescences are puberulous and the leaf crenations much more distinct than in the Sabana El Venado endemic. The other crenate-leafed species of *Ilex* with panicles of racemes (cf. *I. martiniana* Don) have much longer leaves. The various ♀ collections of *I. savannarum* show stages in inflorescence reduction from singly-borne flowers on short leafy branches through such flowers on non-leafy bud-terminated branches to racemose inflorescences. *I. savannarum* has the same habit as *I. divaricata* Mart. ex Reiss., which also is found in Sabana El Venado.

Ilex yutajensis Wurdack, sp. nov. Fig. 24, D–F.

Ex descr. *I. loretoicae* Loes. affinis sed foliis minoribus venis subtus vix reticulatis.

Frutex 2 m, glaber. Ramuli crassi i.s. longitudinaliter striato-sulcati. Petioli 7–9 mm longi 2.5–3 mm crassi; stipulae 0.9 × 0.6 mm triangulares apice parce acuminatae; lamina (6–) 7–9 (–10.5) × (4–) 5–6 (–6.5) cm apice rotundata vel subretusa (raro subobtusa) basi rotundata crasse coriacea ad margines remote (utrinque 5–7) sed distincte crenulato-serrulata supra nitidula subtus opaca et modice punctulata, venis lateralibus utrinque 5–7 supra plerumque indistincte insculptis subtus subelevatis ad margines arcuato-connectis sed vix reticulatis. Inflorescentiae ♀ in foliorum axillis vel in foliorum delapsorum axillis plerumque 5–6(sed usque ad 12)-fasciculatae 1-florae; pedunculi (5–) 6–8(–9) mm longi. Fructi 4-meri; calycis lobi singuli ca. 1 × 1.3 mm rotundata; drupa 4-pyrena ellipsoideo-sphaeroidea 5–6 mm diam. i.s. irregulariter sulcata stigmate prominulo 0.5 mm alto et 1–1.3 mm diam. coronata, pyrenis trigonis 4 mm longis. Flores ♂ et flores ♀ ignoti.

VENEZUELA: Amazonas: Cerro Yutaje, Río Manapiare, occasional on northeast ridge above Camp Yutaje; leaves very brittle and coriaceous; alt. 1500 m; 23 Feb 1953, *Bassett Maguire & Celia K. Maguire 35398* (holotype, NY).

I. loretoica has leaf blades 12–18.5 × 5–9 cm with manifestly reticulate veins. Other Andean species (*I. scopulorum* H.B.K., *I. anonoides* Loes., *I. obtusata* Turcz., *I. crassifolia* Hook., *I. crassifolioides* Loes.) with leaves similar to *I. yutajensis* all have known solitary ♀ inflorescences or solitary ♂ (and thus by implication solitary ♀) inflorescences, as well as (either or both) other foliar and floral differences. From *I. tateana* Steyermark (the holotype of which has been examined), *I. yutajensis* differs in its smaller proportionately wider leaves with the lateral veins beneath rounded-elevated rather than sharply raised. *Tate 424* was erroneously cited in the original description as a paratype of *I. tateana,* but actually is the type number of *I. culmenicola* Steyerm., a quite different species.

Ilex maguirei Wurdack, sp. nov. Fig. 23, F–H.

I. venezuelensi Steyerm. affinis sed foliis et drupis puberulis.

Frutex 0.5–2 m. Ramuli novelli dense villosuli tarde glabrati. Folia 1.5–2.5 (–3.5) × 1–2(–2.5) cm, breviter petiolata petiolo 2–4 mm longo villosulo, elliptica usque ad ovato-elliptica apice obtusa vel rotundata et minute apiculata basi rotundata, margine i.s. revoluto integerrimo, coriacea subtus primum sparse punctata punctis demum obscuris, primum supra et subtus puberula demum costa subtus excepta plusminusve glabrata, costa media supra impressa subtus elevata, nervis lateralibus supra non evolutis subtus primum obscure evolutis demum obscuris. Inflorescentiae in foliorum axillis solitariae vel ad ligni novelli basim singulatim congestae, ♂ (1–) 3-florae, ♀ 1-florae, griseo-hirtellae; flores 4-meri. Flores ♂: pedunculus et pedicelli uterque plerumque ca. 3 mm longi; calycis lobi 1.5 × 1.2 mm ovato-triangulares apice obtusi extus hirtelli; petala 2.8 × 1.7 mm papilloso-ciliolata extus sparse papilloso-puberula basi 0.7 mm coalita; filamenta 1.5 mm longa; antherae 0.8–0.9 mm longae; pistillodium 1.5 mm diam. depresso-conicum sparse hirtellum. Flores ♀: pedunculus ca. 3 mm longus; calycis lobi, petala, et filamenta ut in floribus ♂; antherae 0.5 mm longae; ovarium subovoideum dense hirtellum 4-loculare; stylus 0.3 mm longus; stigma ovoideo-capitatum 0.6 mm altum. Drupa submatura hirtella 6–7 × 5 mm late elliptica non sulcata stigmate prominulo 0.6–1 mm elevato coronata; pedunculus fructiferus 6–11 mm longus.

VENEZUELA: Amazonas; Cerro de la Neblina, frequent on south slope of cumbre Camp Caño toward Cañon Grande; alt. 1500–1700 m; ♀, flowers white, fruit red-brown; 16 Jan 1954, *Maguire, Wurdack & Bunting 37331* (holotype, NY); west cumbre; alt. 1800 m; ♂; *Maguire, Wurdack & Bunting 37014* (paratype); scrub forest near cumbre camp; alt. 1700 m; ♀; *Maguire, Wurdack & Bunting 37049* (paratype); west escarpment; alt. 1700–1800 m; ♀; *Maguire, Wurdack & Bunting 37079* (paratype).

I. venezuelensis has sparse foliar pubescence restricted to the midvein of the

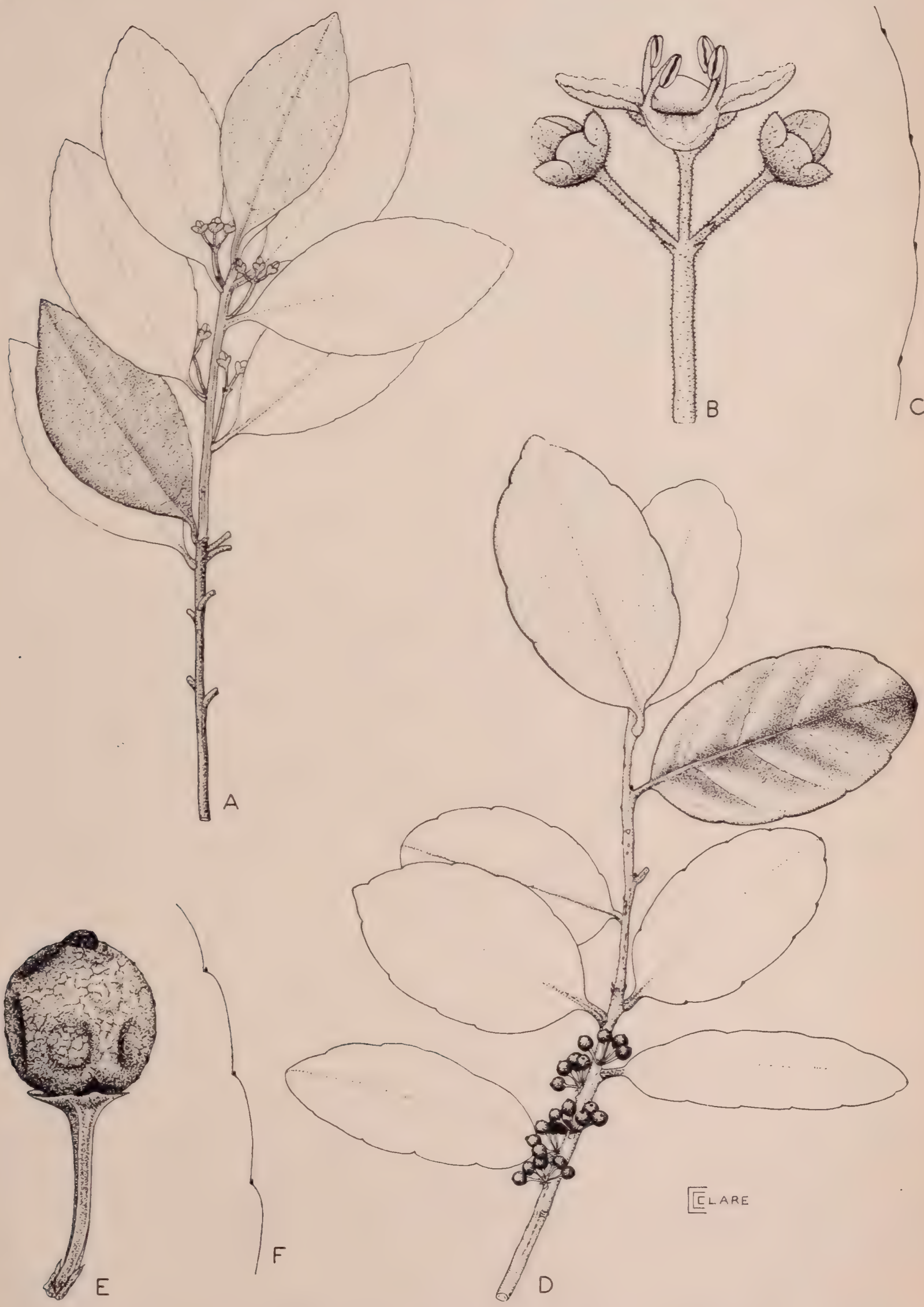


FIG. 24. A–C. *Ilex cowanii.* A, ♂ flowering branchlets, × 0.75. B, ♂ inflorescence, × 3.5. C, leaf margin, × 5. D–F, *Ilex yutajensis.* D, fruiting branch, × 0.5 E, fruit, × 4. F, leaf margin, × 1.

lower leaf surface and glabrous ovaries; it is represented on Neblina by *Maguire, Wurdack & Bunting 37157* and *37192*, as well as *Maguire, Wurdack & Maguire 42098*. The Neblina collections have leaves generally more elliptic than in the unicate Duida holotype; in all collections, the lower leaf surfaces are sparsely punctate. The male inflorescences of *I. venezuelensis* are predominantly 1-flowered and only occasionally 3-flowered.

Other species with entire, more or less hairy leaves and the general aspect of *I. maguirei*, but with epunctate leaves, are *I. asperula* Mart. (with 3–7-flowered ♂ inflorescences, glabrous pistillodia, and leaves pubescent above only on the midrib), *I. organensis* Loes. (with 3-flowered ♀ inflorescences), *I. velutina* Mart. (with 3–7-flowered ♀ inflorescences), *I. subcordata* Reiss. (with glabrous fruit and lateral leaf veins prominulous beneath), and *I. rimbachii* Standl. (with longer pubescence, developed lateral leaf veins, larger ♀ flowers, and fruit with sessile stigma).

Ilex cowanii Wurdack, sp. nov. Fig. 24, A–C.

I. hippocrateoidei H.B.K. affinis sed ramulis novellis et inflorescentiis minute hirtellis, foliis subtus punctatis, et pedunculis longioribus.

Arbor 18 m. Ramuli longitudinaliter striato-sulcati novelli cum pedunculis pedicellis calycibusque sub lente minute modiceque hirtelli. Petioli 5–8 mm longi; stipulae triangulares 0.5 mm longae; lamina (3–)4.5–6(–7) × 2–3(–3.5) cm elliptica apice acuta vel anguste obtusa et mucronulata basi acuta ad margines calloso-serrulata serratulis appressis plerumque 2–3 mm inter se distantibus in venulatione *I. hippocrateoidei* similis subtus modice punctulata subcoriacea. Inflorescentiae ♂ in foliorum axillis vel ad lignum novellum solitariae 1-vel plerumque 3-florae; pedunculi 6–11 mm longi bracteis triangularibus ca. 0.5 mm longis; pedicelli ca. 3 mm longi. Flores ♂ plerumque 4-meri rare 5-meri; calycis lobi singuli 2.3 × 2.3 mm apice rotundati vel truncato-rotundati ad margines ciliolati; petala 4.5–5.3 × 3–3.7 mm oblongo-ovata apice rotundata ad 1.4–1.9 mm coalita. Filamenta 1.5–1.8 mm; antherae 1.5–1.8 mm longae. Pistillodium depresso-conicum ca. 1.2 mm diam. et 1 mm altum rostro apicali ca. 0.4 mm alto. Flores ♀ et fructi ignoti.

VENEZUELA: Amazonas: Cerro Huachamacari, Río Cunucunuma, infrequent in dense woodland along right fork of Caño de Dios above Summit Camp; alt. 1800 m; flowers white and faintly fragrant; 13 Dec 1950, *Maguire, Cowan & Wurdack 30187* (holotype, NY).

I. hippocrateoides has glabrous branchlets and inflorescences, epunctate leaves, and generally longer more slender peduncles. Another apparent near-relative of *I. cowanii* is *I. myricoides* H.B.K., with less dense leaf vein reticulation and more distinct marginal crenation, as well as smaller male flowers. *I. boliviana* Britt. has leaves with veins above much more prominent and with more distinct marginal crenation and also ♂ inflorescences 7–31-flowered with much smaller flowers. *I. truxillensis* Turcz. has proportionately narrower leaves with more distinct marginal crenulations and much smaller flowers.

OCHNACEAE

In his doctoral thesis,[2] unfortunately unpublished, Dwyer discussed at length the relationship of the genera of the Luxemburgieae (all American except *Fleurydora* of Africa). Dwyer suggests that the several genera of the tribe are polyphyletic, and that the Dilleniaceae, the Violaceae, the Eucryphiaceae, and the Hypericaceae are possibly all involved in the phyletic history. A key to the genera of the Luxemburgieae, upon which we have drawn, is likewise presented in the thesis.

---

[2] Dwyer, John D. The American species of the Luxemburgieae (Ochnaceae), unpublished thesis in biology, Fordham University, 1941.

Of the sixteen genera of the Luxemburgieae here recognized, six (*Tyleria, Poecilandra, Leitgebia, Philacra, Adenanthe,* and *Adenarake*) are wholly endemic to the upland habitats of the Guayana sandstone mountains. The genus *Sauvagesia* is well represented in the Guayana Highland, and possibly finds its most primitive species here; indeed, this area may well be the center of distribution of this the largest and most widespread genus of the tribe. The monotypic *Pentaspatella,* certainly closely related to *Sauvagesia* (and included in *Leitgebia* by Dwyer), is found in low-altitude savannas in the Orinoco-Negro drainage, in which the floras are conspicuously related to those of the sandstone highlands. *Blastemanthus* and *Wallacea,* perhaps most closely to be associated with the Highland *Poecilandra,* are confined to the Río Negro–Alto Orinoco drainages. Ten of the sixteen genera are thus found exclusively within Guayana.

Lavradia, with *Adenarake* of the Guayana Highland its most immediate congener, is found exclusively in the Brazilian Highland to the south of the Amazon, as is the larger genus *Luxemburgia,* which finds its closest relative in the Guayana genus *Philacra.*

The remaining genera, *Cespedezia,* with four or five widespread Hylean species, *Rhytidanthera* with four Andean species, *Godoya* with two Andean species, and *Krukoviella* with a single species known from the upper Amazon, occupy a third geographic genus-grouping within the tribe.

Key to the Tribes and Genera of American Ochnaceae

1. Carpels free and distinct; receptacle conspicuously enlarged at maturity; *Ourateeae* (three genera; only 1 American, + 100 spp.). 1. *Ouratea.*
1. Carpels fused; receptacle not enlarged at maturity.
  2. Fruit an indehiscent nut; seed without endosperm; *Elvasieae* (a single American genus, 5–6 spp.). 2. *Elvasia.*
  2. Fruit drupaceous or capsular; seed with endosperm; ovary 2–5-celled; *Luxemburgieae* (15 genera, all American except *Fleurydora* of Africa).
    3. Stamens completely cyclic, i.e. forming a complete ring around the base of the ovary.
      4. Pistils tricarpellate or pentacarpellate; capsules intruded at the sutures; ovules borne on intruded parietal placentae.
        5. Pistils pentacarpellate, the styles short, no more than one-sixth the length of the ovary; staminodia lacking; bracts appendaged proximally and ventrally.
          6. Stipules of uppermost leaves persistent; sepals less than half the length of the petals in the mature bud; stamens numerous; seed linear-fusiform. (7 spp. acc. Dwyer). 3. *Cespedezia.*
          6. Stipules all deciduous; sepals half the length of or equal in length to the petals in the mature bud.
            7. Leaves compound; stamens 50–70, the filaments at least half the length of the anthers. (4 spp.) 4. *Rhytidanthera.*
            7. Leaves simple; stamens 10, the filaments less than half the length of the anthers.
              8. Sepals obviously unequal, appendaged ventrally and proximally; anthers dehiscing by two pores. (2 spp.) 5. *Godoya.*
              8. Sepals subequal, not appendaged ventrally or proximally; anthers dehiscing by a single pore. (1 sp.) 6. *Krukoviella.*
        5.. Pistils tricarpellate, the styles subulate, as long as or longer than the ovary; staminodia rarely lacking; bracts appendaged neither ventrally nor proximally.

9. Staminodia subulate or lance-capitate, free to the base; cupulate corona lacking.

10. Sepals 8–10; stamens 10, biporous; seed linear-elliptic, acute at both ends, narrowly winged. (4 spp. acc. Dwyer.) 7. *Blastemanthus.*

10. Sepals 5; stamens 5, uniporous; body of seed oval, broadly membranous-winged. (3-4 spp.). 8. *Poecilandra.*

9. Staminodia, at least the inner whorl, oblong or oblanceolate, united at the base into a cupulate corona.

11. Seed conspicuously membranous-winged; stipules greatly inequilateral, the left-hand member before vernation tightly enwrapping the blade. (8 spp.) 9. *Tyleria.*

11. Seed not at all winged.

12. Sepals conspicuously glandular; seed strongly muriculate; stipules equilateral, auriculiform. (1 sp.) 10. *Adenarake.*

12. Sepals not at all glandular.

13. Segments of the exterior corona united almost to the summit, thus forming a deep cup; interior corona lacking. (9 spp. acc. Dwyer.) 11. *Lavradia.*

13. Segments of the corona united at the base, thus forming a shallow cup; interior corona often present.

14. Ovules several, obviously parietal. (± 20 spp.) 12. *Sauvagesia.*

14. Ovules 1 or 2, basal.

15. Shrubs; stipules conspicuous, usually persistent; flowers axillary. (1 sp.) 13. *Leitgebia.*

15. Herbaceous perennials; stipules minute, caducous; inflorescence paniculate, terminal. (1 sp.) 14. *Pentaspatella.*

4. Pistils bicarpellate; suture of the capsule not at all intruded; ovules parietal.

16. Sepals conspicuously glandular; androecial corona and staminodia strongly developed; capsule thin-walled, the seed membranous-winged; leaves sessile, the equilateral, broadly ovate stipules persistent; secondary veins of the blade numerous, 5–6 per mm, ascending at 75–85° angle. (1 sp.) 15. *Adenanthe.*

16. Sepals eglandular; androecial corona and staminodia lacking; capsule thick-walled, woody, the seed not winged; leaves conspicuously petiolate, the narrowly lanceolate inequilateral stipules quickly deciduous; secondary veins numerous, 6–8 per mm, ascending at ca. 35–45° angle. (2 spp.) 16. *Wallacea.*

3. Stamens incompletely cyclic, i.e. inequilaterally arranged to one side of the base of the ovary.

17. Capsule dehiscing from the base upward, remaining attached at the apex; ventral cells of the anther longer than and forming a distinct cap or projection over the dorsal; leaves not apically aristate. (3 spp.) 17. *Philacra.*

17. Capsule dehiscing from the apex, at length the carpels free to the base; ventral cells of the anther not forming a cap over the dorsal; leaves characteristically apically aristate. (16 spp. acc. Dwyer.) 18. *Luxemburgia.*

Cespedezia spathulata (R. & P.) Planch. Lond. Jour. Bot. **5**: 647. 1846.

In the revision of the genus by Dwyer,[3] the range of this handsome tree was given as British Guiana, Colombia, Brazil, Peru, and Ecuador. It could reasonably have been expected to occur also in Venezuela. We now have the following three records, all from mixed submontane rain-forest in Terr. Amazonas, Venezuela: Cerro Huachamacari, *Maguire, Cowan & Wurdack 30345;* Cerro Yutaje, *Maguire & Maguire 35027;* and Cerro Coro-Coro, *Maguire & Maguire 35511.*

---

[3] Lloydia 9: 59. 1946.

Tyleria Gleason, Bull. Torrey Club **58**:391. 1931.

This interesting genus began its taxonomic history with the publication by Gleason in 1931 of four species, all collected on Cerro Duida, viz. *Tyleria floribunda, T. grandiflora, T. linearis,* and *T. spathulata*. Only the last has been found elsewhere, being a prominent element of the cumbre flora of Cerro Huachamacari, a sandstone mountain that lies to the north of and adjacent to Cerro Duida, and on Serranía Parú, which lies some 150 km to the north.

Our more recent visits to Cerro de la Neblina, more than 300 km to the south of Duida, have resulted in the discovery of four additional species. It is not to be unexpected that further species of *Tyleria* will be found as the great cerros of Neblina and Duida and the immediately associated tabular mountains as yet unvisited by botanists become more fully explored or initially visited.

For those presently known, a curious relationship develops. The four newly discovered species of Neblina stand as morphologic and geographic analogues of their Duida congeners; the eight species thus stand as four mutually bracketed and related pairs.

Tyleria floribunda of Duida and *T. spectabilis* of Neblina bear overwhelming morphologic evidence of immediate affinity in habit. In form of leaf and inflorescence they are exceedingly similar, differing largely in leaf apex and margin and critical characters of the flower. *T. floribunda,* the largest tree of the genus on Duida, is strikingly fastigiate. *T. spectabilis,* the largest tree of the genus on Neblina, is fastigiate-candelabriform.

Tyleria pendula is certainly the analogue of *T. spathulata*, the inflorescence of the first being pendulous and more nearly racemiform, and the leaves more strongly petiolate and strongly aristate. The two occupy comparable ecological niches in their respective geographical areas.

Tyleria linearis of Duida and *T. aristata* of Neblina are both wiry-stemmed shrubs of closely similar habit, forming dense thickets along water-courses. Their flowers are solitary and axillary; yet the leaves of *T. linearis* are, as the name indicates, narrowly linear and sessile and quite devoid of an arista, while the leaves of its Neblina counterpart are elliptic, petiolate, and strongly aristate.

The fourth pair, *Tyleria grandiflora* and *T. tremuloidea*, are less obvious analogues, yet they are probably most nearly interrelated between themselves than to other species of the genus.

It is thus most interesting to postulate a parallel evolution of each of the pairs from a common forerunner, or the segregation of one of each set directly from its analogue. If such a postulation holds, and it is abundantly supported by morphologic analogy, it is exceedingly difficult to give basis to genetic explanation for the presence of the strong aristate leaf-tip that obtains absolutely for the Neblina series, and is absolutely absent from the Duida series. This character, certainly of genetic significance, cuts directly across otherwise clear lines of affinity of the eight species so involved. An alternative explanation is the evolution from two ancestors, with parallel adaptation to similar habitats.

Key to the Species of *Tyleria*

1. Inflorescence broadly compound-paniculate; flowers rose or pink; leaves coriaceous or subcoriaceous, oblong-elliptic, normally exceeding 12 cm in length.
    2. Leaves neither scarious-margined nor aristate (in material available); sepals elliptic–lanceolate, not scarious-margined, acutish, at maturity 10–12 mm long; internodes of the branchlets 4–10 mm long; leaf-scars transversely lunate or subreniform. *T. floribunda.*

2. Leaves conspicuously scarious-margined and apically aristate; sepals oblong, obtuse, strongly scarious-margined toward the apex, 4.0–5.5 mm long; internodes of the branchlets 1–2 mm long; leaf-scars transversely linear. *T. spectabilis.*

1. Inflorescence racemose or narrowly subpaniculate; flowers white; veins departing from the midrib at about 45°.

3. Leaf-blades broadly oblanceolate, their dimensions exceeding 2 × 7 cm; inflorescence 20–40-flowered.

4. Leaves subsessile or the petiole broad, 1 cm or less long, the apex of the blade totally devoid of an arista; inflorescence erect or ascending; petals broadly obovate, 16–18 mm wide, 20–22 mm long. *T. spathulata.*

4. Leaves manifestly petiolate, the petiole 2–4 cm long, the apex of the blade strongly aristate, the arista 6–12 mm long; inflorescence pendulous; petals oblong-elliptic to oblanceolate, 5–8 mm broad, 14–18 mm long. *T. pendula.*

3. Leaf-blades narrowly lanceolate, their dimensions 1.5 × 6.0 cm or less, strongly aristate, the petiole slender, 1.2–1.8 cm long; inflorescence (1–)3–5-flowered. *T. tremuloidea.*

1. Inflorescence a 1–3-flowered cyme, most commonly uniflorous.

5. Sepals broadly obtuse; flowers 6–8 cm in diameter; leaves oblong-obovate, broadly obtuse, obviously sessile, totally devoid of an arista; branchlets relatively coarse, 2.5–4.0 mm diam. *T. grandiflora.*

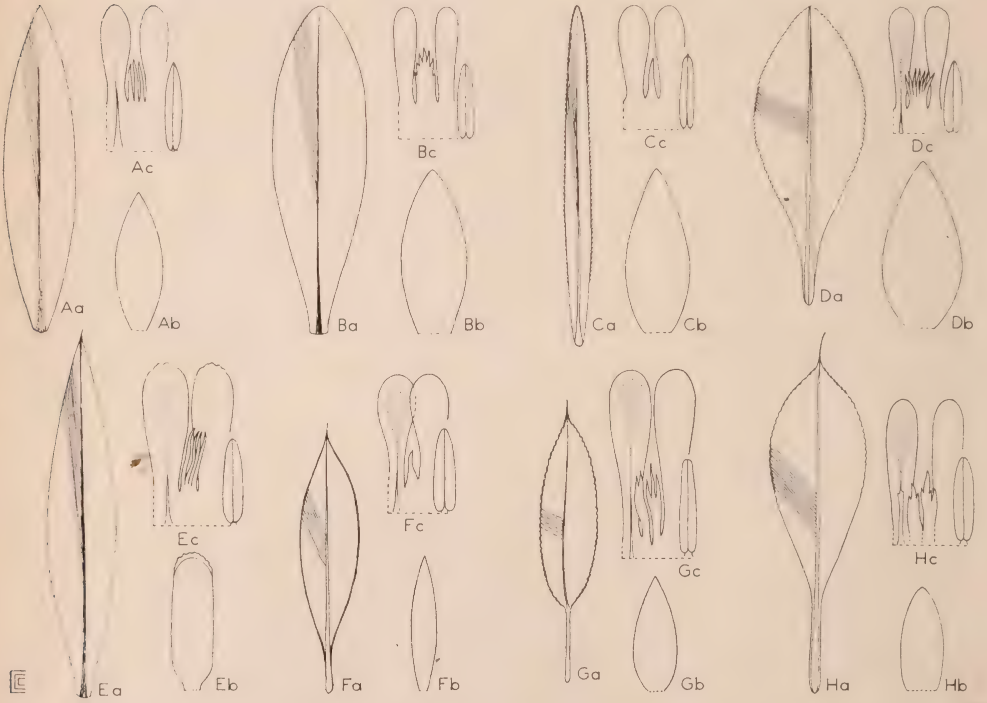


FIG. 25. Diagrammatic representation of leaves, sepals, and inner tangential view of segment of the corona, consisting of primary staminodia, secondary staminodia, and stamen. Aa–c, *Tyleria floribunda;* leaf, × 0.375; sepal, × 1.5; corona, × 1.5. Ba–c, *T. grandiflora;* leaf, × 0.75; sepal, × 1.5; corona, × 1. Ca–c, *T. linearis;* leaf, × 0.5; sepal, × 1.5; corona, × 1.25. Da–c, *T. spathulata;* leaf, × 0.25; sepal, × 1.5; corona, × 1.25. Ea–c, *T. spectabilis;* leaf, × 0.25; sepal, × 3; corona, × 2. Fa–c, *T. aristata;* leaf, × 0.375; sepal, × 0.5; corona, × 1.5. Ga–c, *T. tremuloidea;* leaf, × 0.375; sepal, × 0.5; corona, × 1.5. Ha–c, *T. pendula;* leaf, × 0.25; sepal, × 1; corona, × 2.

5. Sepals acute; flowers 4 cm or less in diameter; branchlets wiry, 1.5–2.5 mm in diameter.
    6. Leaves narrowly linear-lanceolate, 3–6 mm broad, 3–6 cm long, totally devoid of an arista; sepals elliptic, 4–5 mm wide, 11–13 mm long. *T. linearis.*
    6. Leaves elliptic, 6–15 mm broad, 3–7 cm long, strongly aristate; sepals narrowly lanceolate, 2–3 mm wide, 18–20 mm long. *T. aristata.*

Tyleria spectabilis Maguire & Wurdack, sp. nov. Fig. 25 E.

Arbor parva ad 15 m altam, 20 cm diam.; ramis adscendentibus candelabriformibus crassis, 12–15 mm diam.; internodiis brevissimis, 1–2 mm longis, cicatricibus foliorum et stipularum prominentibus; stipulis tarde deciduis; foliis rubritinctis, subcoriaceis, sessilibus lanceolatis 10–15 cm longis, 15–30 mm latis, ad apicem anguste acutis in arista 5–7 mm longa productis, multivenatis, venis ad 80° angulum adscendentibus; margine integra rubro-brunnea scariosa, tarde lacerata deciduaque, ad apicem item minute spinulosa; stipulis castaneis valde inaequalibus, parviore lanceolato-acuminata 1.5–2.0 cm longa, maiore oblongo-lanceolata, acuminata 4.0–5.0 cm longa aristata; inflorescentiis multifloribus ample paniculatis roseis vel subrubris, pyramidalibus, 12–18 cm longis, 10–15 cm latis, bracteolis primariis et secondariis 4–20 mm longis, linearibus, integris vel laceratis caducis; pedicellis tenuibus in anthesi 8–15 mm longis, demum ad 30 mm longos; sepalis plus-minusve aequalibus 4–5.5 mm longis, oblongis obtusis ad apicem conspicue glandulari-scariosis; petalis elliptico-oblongis, obtusis, 15–20 cm longis 8–12 mm latis, roseis; androgynophoro ca. 2 mm alto; corona 1-cyclica, staminodiis 5, oblongo-oblanceolatis 2–3 × 6–7 mm, ad apicem minute irregulariterque crenulatis, carina ventrali prominenti, appendicibus alternatis profunde laceratis 1–4 segmentis linearibus, aristatis, ca. 3–4 mm longis; staminibus 5, subsessilibus, ca. 4.5 mm longis, obtusis; ovario conico, 3-loculari; ovulis numerosis, placentis profunde intrusis, parietalibus; stylo simplice integro subulato, stigmate punctiformi; capsula conica, ca. 12 mm longa, stylo persistenti; seminibus 2.2–2.5 mm longis, 0.8–1.0 mm latis, testa membrano-alveolata, valde alata.

VENEZUELA: Amazonas: Cerro de la Neblina, frequent in low intervale forest, slopes vicinity of Cumbre Camp at 1800 m alt.; small tree to 7 m high, branches coarse-ascending; leaves glossy green, red tinged, in terminal rosettes, ascending in vegetative shoots, patent or reflexed in flowering branches; inflorescence red, petals pink with yellow centers, anthers deep pink; 4 Jan 1954, *Maguire, Wurdack & Bunting 37033* (holotype, NY). Cerro de la Neblina, in 1954, *Maguire, Wurdack & Bunting 37015, 37092, 37167, 37350* (paratypes); in 1957, *Maguire, Wurdack & Maguire 42117, 42274, 42462* (paratypes).

Distribution: a very handsome candelabra-like tree known only from the cumbre of Cerro de la Neblina. In protected intervale habitats, it becomes a tree reaching nearly fifty feet in height; on exposed summits stature may be reduced to five feet or less. *T. spectabilis,* surely one of the more beautiful of flowering trees in the American tropics, is obviously most nearly related to *T. floribunda* of Cerro Duida, which it closely resembles in habit and form. However, there are differences in leaf margin and apex, as well as critical flower characteristics.

Tyleria pendula Maguire & Wurdack, sp. nov. Figs. 25H, 26A–K.

Frutex pauciramosus virgatus gracilis vel arbor parva pauciramosa, 1–8 m alta; ramis tenuibus 3–5 mm diam., nodis vulgo 2–8 mm longis; foliis petiolatis, laminis oblanceolatis vulgo 2.5–4.5 cm latis, 7–11 cm longis, multivenatis, venis ad 45° adscendentibus, margine minute spinuloso-serrulata, apice obtuso vel late

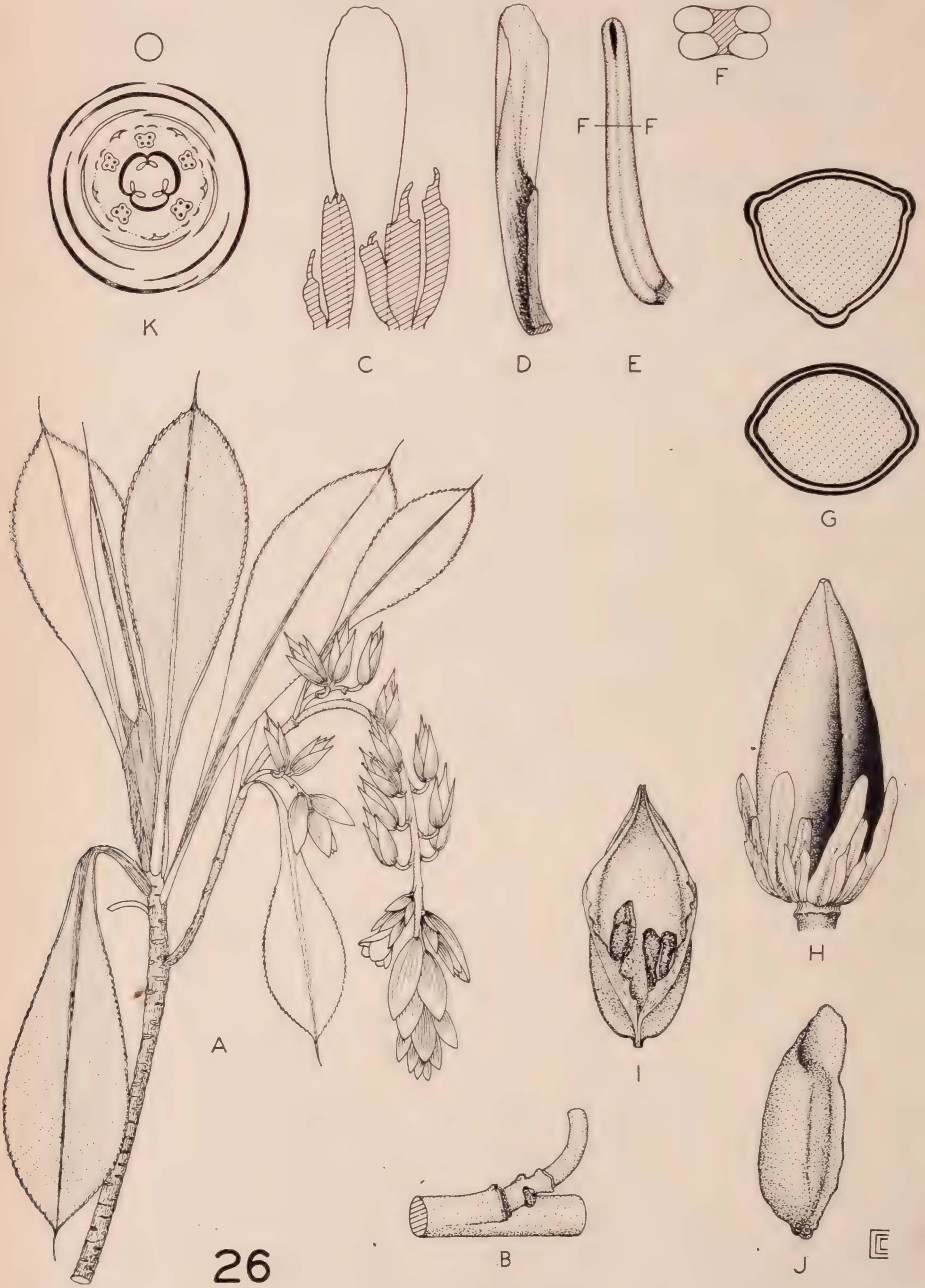


FIG. 26. A–K, *Tyleria pendula.* A, habit, × 0.5. B, segment of flowering axis, × 2.5. C, inner tangential segment of corona showing primary and secondary staminodia, × 7.5. D, inner view of primary staminodia, × 7.5. E, lateral view of stamen, × 10. F, cross section of anther, × 15. G, outline of pollen grains, × 1070. H, capsule, × 3. I, dehisced valve (carpel), × 3. J, seed, × 7.5. K, cross diagram of flower.

acuto, in aristam 6–12 mm longam abrupte producto, ad basim anguste acutis; petiolis 2–4 cm longis, dorsi-ventraliter complanatis, anguste alatis; inflorescentiis cernuis vulgo racemosis 10–15 cm longis, saepe ad basim paniculatis; bracteis primariis integris ovali-ellipticis 15–20 mm longis, 8–10 mm latis, obtusiusculis, bracteis secondariis et tertiariis late ellipticis vel obovatis ad 8 mm longis; pedicellis subcrassis, 3–6 mm longis, recurvatis; calyce quincunciali; sepalis 5, coriaceis lanceolatis multivenatis, exterioribus acutiusculis, interioribus obtusiusculis 10–13 mm longis; petalis albidis ad basim flavis, oblongo-ellipticis vel oblanceolatis, obtusis, 14–18 mm longis, 5–8 mm latis; androgynophoro 0.5–1.0 mm longo, corona 1-cyclica; staminodiis staminibus alternatis 5, oblanceolatis integris vel ad apicem minute crenulatis, 6–7 mm longis, 1.5–2.0 mm latis, carina ventrali prominenti, appendicibus staminibus oppositis vulgo 10, vulgo 2–3-fidis vel integris, saepe aliquantum laceratis, 2.0–2.5 mm longis; staminibus 5, staminodiis alternatis, ca. 4 mm longis, 4-thecatis, poris subapicalibus lateralibus dehiscentibus; granis pollinis 3-poris, 20–23 μ diam.; ovario conico 3-loculari, ovulis numerosis placentis profunde intrusis parietalibus; stylo simplice integro subulato, stigmate terminali; fructu capsulari conico ca. 14 mm longo, septicidali, stylo vulgo deciduo; seminibus elliptico-oblongis 2.5–3.0 mm longis, 1.2–1.3 mm latis, rubro-purpureis, unilateraliter et ad apicem conspicue alatis.

VENEZUELA: Amazonas: Cerro de la Neblina, abundant, exposed ridge, West Escarpment Savanna, 8 km west Cumbre Camp; alt. 2000 m; virgate slender shrub with nodding reddish glaucous inflorescence, leaves red-edged, petals white basally yellow, stamens cream; 15 Jan 1954, *Maguire, Wurdack & Bunting 37293* (holotype, NY). Cerro de la Neblina, in 1954, *Maguire, Wurdack & Bunting 37113* (paratype); in 1957, *Maguire, Wurdack & Maguire 42161, 42257, 42286* (paratypes).

Distribution: known only from Cerro Neblina, where it is a conspicuous virgate shrub 1–2 m high on exposed ridges. In intervale woodland it becomes a small tree reaching a height of 8–10 m.

Its closest congener is *Tyleria spathulata* of Cerro Duida, with which it shares similar but non-pendent inflorescences, and leaves similar in general form and venation.

Tyleria aristata Maguire & Wurdack, sp. nov. Fig. 25F.

Frutex multum ramosus ad 3 m altum; ramulis tenuibus 1–2 mm diam., nigrescentibus; foliis plus-minusve confertis, petiolatis; petiolis 3–5 mm longis, planis, ca. 1.5 mm latis; stipulis inaequalibus, dextrorsum anguste lineari-acuminatis ca. 5 mm longis ciliatis aristatis tarde caducis, sinistrorsum 15–20 mm longis membranaceis pauciciliatis vel eciliatis aristatis, circum gemmas foliis involutis, mox caducis; laminis anguste ellipticis vulgo 3–5 cm longis 6–12 mm latis, ad apicem acutis conspicue aristatis, ad basim acutis in petiolo aliquantum decurrentibus; venis improminulis, ad 65–75° adscendentibus, margine minute serrulato-ciliatis; floribus solitariis axillaribus, pedicellis 7–9 mm longis; calyce quincunciali; sepalis 5, lanceolatis acutissimis vulgo 17–20 mm longis ca. 2.5 mm latis, multinervatis; petalis 5 obovatis vel oblanceolatis, 16–18 mm longis 8–10 mm latis; androgynophoro ca. 1 mm alto, corona 1-cyclica; staminodiis 5, oblongo-spathulatis 8–9 mm longis, 1.7–2.0 mm latis, carina ventrali conspicue sursum saepe in liberam appendicem a 1 mm longa producta, staminodiis a basim aliquando laceratis, saepe 1–2 mm connatis; staminibus 5, sessilibus, ca. 3 mm longis, ad apicem in appendicem 0.5–0.7 mm longam productis; ovario conico, praecipue 3-loculari, ovulis numerosis, placentis intrusis; stylo subulato 7–8 mm longo.

VENEZUELA: Amazonas: Cerro de la Neblina, abundant and dominant along streamcourse in open savanna, 12 km sw Cumbre Camp; alt. 2000 m; flexuous shrub 0.3–2.0 m high, flowers white, petals pale yellow at base; *Maguire, Wurdack & Maguire 42288* (holotype, NY). Cerro de la Neblina, alt. 1800 m, *Maguire, Wurdack & Bunting 37352* (paratype); alt. 2000 m, *Maguire, Wurdack & Maguire 42262* (paratype); alt. 1900 m, shrub 0.5–3.0 m high, petals white, pale orange at base, *Maguire, Wurdack & Maguire 42372* (paratype).

Known only from streamside habitats on the summit of Cerro de la Neblina, but there often abundant and exerting dominance.

Tyleria tremuloidea Maguire & Wurdack, sp. nov. Fig. 25G.

Frutex vel arbor parva ad 6 m altam; ramis ramulisque candelabriformibus, ramulis teretibus lucidis rubritinctis, 2–3 mm diam., internodiis 2–4 mm longis; foliis alternatis belle tremulis adscendentibus; stipulis amplexicaulibus caducis integris lanceolatis 6–8 cm longis ca. 8 mm latis circum gemmas valde involutis; petiolis tenuibus compressis 0.7–1.0 mm latis, 12–18 mm longis; laminis firme subcoriaceis supra lucidis, lanceolatis 10–16 mm latis, 4.5–6.0 cm longis, ad basim plus minusve acutis, ad apicem anguste acutis, in aristam 5–7 mm longam productis; inflorescentiis terminalibus racemosis 2-4-floribus, 4–6 cm longis; bracteis primariis. cum stipulis praeditis, 0.5–1.5 cm longis, aristatis; bracteis secondariis sine stipulis, deinceps parvioribus, exaristatis; pedicellis vulgo 12–15

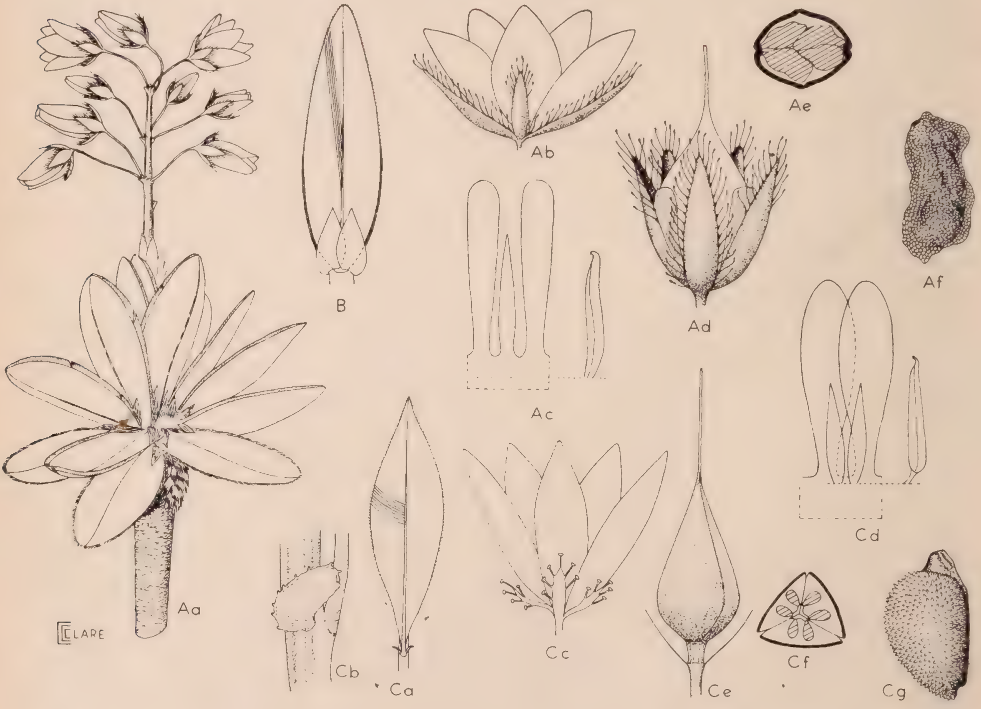


FIG. 27. Aa–f, B, *Adenanthe bicarpellata;* Aa, habit, × 0.5; Ab, diagram of flower, × 0.75; Ac, inner tangential view of segment of corona, and stamen, × 2; Ad, capsule, showing persistent calyx and corona, ×1.25; Ae, cross section of capsule, ×1.25; Af, seed, ×3.75. B, leaf showing position of stipules, × 0.375. Ca–e, *Adenarake muriculata;* Ca, leaf, × 0.25; Cb, stipule, × 2.5; Cc, flower, 0.75; Cd, inner tangential view of segment of corona, and stamen, × 2.5; Ce, capsule, × 1.5; Cf, cross section of ovary, × 1.5; Cg, seed × 10.

mm longis articulatis; floribus conspicuis; sepalis 5, imbricatis lanceolatis acutis 16–20 mm longis, 7.5–8.5 mm latis, valde multinervatis; petalis albis obovatis late obtusis 25–40 mm longis, 18–30 mm latis, multinervatis; staminodiis dimorphicis, in corona 2–3 mm alta dispositis; staminodiis alternatis, spathulato-oblanceolatis, obtusis, 8.5–9.5 mm longis, ca. 2.5 mm latis, 7–9-nervatis, ad basim interne valde carinatis; appendicibus staminibus oppositis 10–15, squamosis, 3–5 mm longis, simplicibus vel profunde trilaceratis, acuminatis, aristatis; staminibus 5 in discis depositis, subsessilibus introrsis oblongo-linearibus obtusis, ca. 6 mm longis lateraliter dehiscentibus; granis pollinis plus-minusve sphaeroidalibus 3-colporatis, ca. 20–22 μ diam.; ovario 3-loculari, placenta parietali, ovulis numerosis, stylo simplici, integro, subulato; capsula ca. 12 mm longa septicidali; seminibus non visis.

VENEZUELA: Amazonas: Cerro de la Neblina, often locally dominant and abundant, in low *Bonnetia* scrub at 2000 m alt., north head of Cañon Grande; fastigiate shrub or small tree to 6 m high, leaves shining, tremulous; 8 Dec 1957; *Maguire, Wurdack & Maguire 42330* (holotype, NY); Cerro de la Neblina, east basin upper Cañon Grande, East Escarpment, alt. 2000 m; shrub 3–5 m high, petals white, pale orange at base, abundant; 13 Dec 1957, *Maguire, Wurdack & Maguire 42383* (paratype); abundant and often dominant in *Tyleria-Bonnetia* scrub, escarpment trail, alt. 2000 m; shrub or small tree 1–5 m high, petals white, pale orange at base; 17 Dec 1957, *Maguire, Wurdack & Maguire 42431* (paratype).

Adenarake Maguire & Wurdack, gen. nov.

Inflorescentia paniculata, bracteis dissectis, patelliformi-glandulosis, sepalis unicyclicis; androgynophoro androeciali cupuliformi;; staminodiis 2-seriatis; staminibus 5; ovario 3-carpellato, placentis centralibus; capsula septicidali; seminibus ellipticis echinulatis. Frutex; foliis alternatis, stipulis similibus inaequaliter flabelliformibus.

Typus: *Adenarake muriculata* Maguire & Wurdack.

The name is from adēn, ἀδήν, gland and arakē, ἀράκη, cup.

Adenarake muriculata Maguire & Wurdack, sp. nov. Fig. 27C.

Frutex parvus tenuis pauciramosus, ad 2 m altum; ramis 1.5–3.0 mm diam., glabris; foliis alternatis, vulgo 1–3 cm distantibus; petiolis 2–5 mm longis, tenuibus; stipulis similibus, inaequaliter flabelliformibus 2–3 mm longis glanduloso-denticulatis, demum caducis; laminis elliptico-lanceolatis (3–) 5–8 cm longis, 1.8–2.5 cm latis, chartaceis, ad apicem acuminatis ad basim acutis vel acuminatis; margine minute serrulato glanduloso-ciliato, petiolis 2–3 mm longis; inflorescentiis anguste paniculatis, bracteis bracteolisque plus minusve dissectis, patelliformi-glandulosis; pedicellis subfiliformibus 1.5–3.0 cm longis; sepalis 5, unicyclicis praecipue valvatis, oblongis ca. 5 mm longis, 1.0–1.2 mm latis, ad apicem 4–6-pectinato-patelliformiglandulosis; petalis ellipticis 12–15 mm longis, 6–7 mm latis, acutis; androgynophoro ca. 1.5 mm alto, corona androeceali cupuliformi ca. 1 mm alta; staminodiis 2-seriatis, exterioribus 10, lanceolatis 3.0–3.5 cm longis, 0.7–0.8 mm latis, staminibus oppositis, interioribus 5, spathulato-oblanceolatis 6–7 mm longis, ca. 2 mm latis, 1-nervatis, staminibus alternatis; staminibus 5, filamentis ca. 0.3 mm longis; antheris lanceolatis ca. 4 mm longis, ca. 0.6 mm latis, in apiculum 0.5 mm longum productis, 4-thecatis disto-lateraliter dehiscentibus; ovario ad basim coronae disposito, conico, 3-carpellato, ad basim 3-septato, placentis centralibus, ovulis ca. 20 evidenter anatropis; capsula septicidali, ad basim solo intruso-septata; seminibus ellipticis, 1.1–1.5 mm longis, 0.7–0.8 mm latis brunneis, bicuspidatis minute echinulatis.

VENEZUELA: Amazonas: Cerro de la Neblina, occasional under upper escarpment, cliffs above Camp III, alt. 1800 m; shrub 1–2 m high, inflorescence maroon, petals pink, yellow at base; 24 Dec 1953, *Maguire, Wurdack & Bunting 36837* (holotype, NY); Cerro de la Neblina, in 1953, *Maguire, Wurdack & Bunting 36846, 36922, 36954;* in 1957, *Maguire, Wurdack & Maguire 42042, 42426* (paratypes).

Adenarake muriculata superficially resembles *Adenanthe bicarpellata* in the somewhat similar glandular calyx, and *Lavradea* in general habit. It is obviously closely related to neither, but has more probably developed along an independent evolutionary line. The cyclic calyx, conspicuous androgynophore, and septicidal capsule, valvate above and completely (3–) septate at the base, are unique in the tribe.

Sauvagesia L. Sp. Pl. **1**:203. 1753.

Sauvagesia erioclada Maguire & Phelps var. **grandiflora** Maguire & Wurdack, var. nov.

A var. *erioclada* differt floribus maioribus.

VENEZUELA: Amazonas: Cerro Yutaje, frequent in thickets in scrub forest on Northwest Ridge, alt. 1400 m; slender virgate shrub 1–3 m tall, petals white, corona purple; 11 Feb 1953, *Maguire & Maguire 35151* (holotype, NY).

S. erioclada var. *erioclada* has sepals 4.1–6.1 mm long, the inner corona 2.8–4 mm long, and anthers 1.8–2.2 mm long. In var. *grandiflora* the sepals are 8–10 mm long, the inner corona 4.8–5 mm long, and the anthers 2.5–2.6 mm. All measurements were taken on dry fruiting material. The leaf variability range in recent collections of *S. erioclada* is quite great, but the leaves are always thinly coriaceous to coriaceous with acute to broadly acute apices. The collections of var. *erioclada* now include: Cerro Yutaje, *Maguire & Maguire 35101, 35300, 35313, 35332;* Cerro Coro-Coro, *Maguire & Maguire 35467;* Cerro Moriche, *Maguire & Maguire 35538, Maguire, Cowan & Wurdack 30839, 30871, 30896, 30920;* Cerro Guanay, *Maguire, Phelps, Hitchcock & Budowski 31659, 31796.*

Sauvagesia duidae Steyermark.

Since both *S. duidae* and *S. grandifolia* Dwyer have similar chartaceous acuminate leaf blades, the only apparent valid morphologic distinction between these two species is in the flower size. In *S. duidae*, the fruiting sepals (dry) are 4.2–5.6 mm long, the inner corona 3.6–3.9 mm, and the anthers 1.8–2.2 mm. In the Brazilian species, the corresponding measurements (dry) are 9.1–9.5 mm, ca. 7.5 mm, and 2.3–2.5 mm. In Venezuela, in addition to the type collection, *S. duidae* is known from the Yapacana savanna edge at 125 m alt. (*Maguire & Wurdack 34521*); for Colombia the species is known from two Amazonas collections: Río Miritiparaná, alt. 200 m, *Schultes & Cabrera 15704* (US); Río Popeyacá, alt. 200 m, *Schultes & Cabrera 16183* (US). For *S. grandifolia*, only the holotype (*Glaziou 6478*, US) is known to us. With some qualms, the following key to this species group is offered:

1. Leaves acuminate, chartaceous.
    2. Sepals 4.2–5.6 mm long; inner corona 3.6–3.9 mm high. *S. duidae.*
    2. Sepals 9.1–9.5 mm long; inner corona ca. 7.5 mm high. *S. grandifolia.*
1. Leaves acute (sometimes apiculate but not acuminate), coriaceous to chartaceous.
    3. Shrubs with erect woody stems; leaves thinly coriaceous to coriaceous; fruiting calyx corneous at the base. *S. erioclada.*
    3. Herbs or usually sprawling subshrubs; leaves chartaceous; fruiting calyx not thickened basally. *S. erecta.*

Sauvagesia elata Benth. subsp. **occidentalis** Maguire & Wurdack, subsp. nov.

Coronae exteriores oblanceolatae ad apicem non incrassatae. Coronae interiores parce minores 2.4–2.5 × 0.9 mm.

VENEZUELA: Amazonas: Cerro Sipapo, mixed montane forest between Intermediate Camp and summit, alt. 600–1500 m; 6 Feb 1947, *Maguire & Politi 28791* (holotype, NY).

S. elata subsp. *elata* has very numerous apically clubbed exterior corona segments, the inner staminodia (2.8–)3–3.7 mm long and less than 1 mm wide; the typical subspecies is limited to lowland British Guiana. In subsp. *occidentalis*, the ± 15 outer segments are 0.2 mm wide and not at all thickened apically, presenting a startling contrast to those of the eastern subspecies.

Sauvagesia nudicaulis Maguire & Wurdack, sp. nov.

S. imthurnianae (Oliver) Dwyer distanter affinis, sed foliis maioribus internodiis distantibus stipulis mox deciduis et maioribus pedunculis nudis vel rare unibracteolatis.

Suffrutex ramosus ad 6 dm. Stipulae valde caducae 5–8 × 2–4 mm marginibus apicem versus serratis serratulis unisetosis setis ad 2 mm longis; internodia ca. 5 mm; lamina tenuiter coriacea 2–4 × 0.5–1 cm oblongo-ovata bis ovata apice obtusa bis hebeti-acuta basi cuneata vix distincte (ad 2 mm) petiolata ad margines incrassata et serrulata dentibus appressis 1.5–3 mm inter se distantibus, nervis lateralibus numerosis tenuibus supra vix argute prominulis subtus obscuris. Flores ex axillis foliorum superiorum singulae; pedunculus 1.5–2.5 cm longus demum cernuus ebracteatus vel rare centraliter unibracteatus bractea lineari 6 × 0.7 mm. Sepala 7.5 × 2 mm ovato-lanceolata apice acuta sed non setosa. Petala 7.5–8 × 3 mm oblongo-obovata apice obtusa. Coronae exteriorae desunt; segmenta coronae interioris 5 oblanceolata 4.8 × 1.4 mm apice rotundata intus basim versus valde carinata. Filamenta 0.5 mm longa; antherae 0.3 × 0.5 mm oblongae apice apiculatae. Stylus 3 × 0.15 mm; stigma punctiforme; ovarii placentae parietales; semina 0.9 × 0.6–0.65 mm dense alveolata.

VENEZUELA: Amazonas: frequent in Savanna No. 3 at northwest base of Cerro Yapacana, alt. 125 m; shrub 3–6 dm tall, flowers white; 20 Nov 1953; *Maguire, Wurdack & Bunting 36572* (holotype, NY); Yapacana savannas, *Maguire, Cowan & Wurdack 30541*, *Maguire & Wurdack 34560* (paratypes); Sabana El Venado on Caño Pimichín, Río Guainía, *Maguire & Wurdack 35580* (paratype); Sabana Hechimoni on Caño Hechimoni, Río Siapa, *Maguire, Wurdack & Bunting 37633* (paratype).

COLOMBIA: Cacagual savanna, Río Atabapo, *Maguire, Wurdack & Bunting 36283*, *Maguire, Wurdack & Keith 41456* (paratypes).

S. imthurniana has leaves about 1 cm long, internodes only 1–3 mm apart, stipules about 2 mm long and only apically lacerate with persistent bases, and multibracteate peduncles.

Sauvagesia imthurniana (Oliv.) Dwyer subsp. **chimantensis** Maguire, Steyermark & Wurdack, subsp. nov.

Folia elliptica bis vix oblongo-elliptica.

VENEZUELA: Bolívar: frequent in upper northwest cumbre of Churi-tepuí, (Muru-tepuí) 2250–2300 m; shrub 0.2–0.5 m, flowers pink; 26 Jan 1953, *Wurdack 34201* (holotype, NY; isotype, F); lower cumbre of Churi-tepuí, *Wurdack 34169* (paratype); Caño Mojado, Torono-tepuí, Chimantá Massif, *Steyermark & Wurdack 991* (paratype); upper part of Auyán-tepuí, *Vareschi & Foldats 4884*, *Tate 1130* (paratypes).

Typical *S. imthurniana*, apparently limited to Mt. Roraima, has oblanceolate or obovate-oblong leaf blades widest above the middle, while subsp. *chimantensis* has leaves widest at or slightly below the middle.

Sauvagesia miniata Steyermark.

Dwyer (Bull. Torrey Club **72**: 535, 536. 1945) assigned *S. ramosissima* Spruce ex Eichler to the *Longifoliae* and by inference selected a Riedel collection as the lectotype; he did not mention the two syntype Spruce collections cited in the original description. In describing *S. miniata*, Steyermark assigned the species, correctly we believe, to Dwyer's *Linearifoliae*, but did not note the affinities with *S. ramosissima*. Our six recent collections of *S. miniata* show no reliable vegetative distinctions from *S. ramosissima;* however the filaments are 0.2–0.4 mm long, the anthers 0.3–0.5 mm long, and the oval to rotund inner corona segments 0.7–1 × 0.5–0.7 mm. For the Riedel collection of *S. ramosissima* at New York, the corresponding measurements are 0.2 mm, 0.7–0.9 mm, and 1.1–1.4 × 0.5–0.55 mm, with the inner corona segments more oblong than in *S. miniata* and the anthers longer with relatively shorter filaments. Mr. Sandwith kindly examined the Kew material of *Spruce 2497* and *3707*, as well as *Ule 7335* and *8227;* he reported floral measurements consistent with *S. miniata* and also wrote that the Riedel collections of *S. ramosissima* at Kew have larger fruiting perianths and fruits than the Spruce and Ule sheets. The original description and plate of *S. ramosissima* offer no basis for upsetting Dwyer's lectotypification, so we believe it best, pending further Brazilian collections of *S. ramosissima*, to accept two very closely related species, with *S. miniata* being widespread north of the Amazon. The following material seems ascribable to *S. miniata*.

VENEZUELA: Bolívar: Isla Casabe, Río Parágua, *Maguire 32710;* slopes of Cerro Bolívar, *Maguire, Wurdack & Bunting 35954;* base of Piedra Marimare, Río Orinoco, *Wurdack & Monachino 40869.* Amazonas: Puerto Ayacucho, *Maguire, Wurdack & Bunting 36184;* Raudal de Atures, *Maguire, Wurdack & Bunting 36120;* Caño Cupueni near San Fernando de Atabapo, *Maguire, Wurdack & Bunting 36231;* Sanariapo, *Steyermark 58467* (isotype NY); Esmeralda Ridge, *Steyermark 57730* (fide Steyermark).

BRAZIL: Terr. Rio Branco: Serra Tepequem, *Maguire & Maguire 40013;* Serra de Carauma, *Ule 7735* (K); Serra do Mel, *Ule 8227* (K, US). Amazonas: Panure, *Spruce 2497* (K); mouth of Rio Içana, *Baldwin 3228* (US).

Sauvagesia linearifolia St.-Hil. subsp. **venezuelensis** Maguire & Wurdack, subsp. nov.

Habitus robustior; sepalorum setae parce minores; capsulae maiores.

VENEZUELA: Amazonas: frequent in Sabana Hechimoni, Caño Hechimoni 8 km above mouth, Río Siapa, alt. 120 m; shrub to 5 dm tall, petals pink basally white, stamens deep rose; 9 Feb 1954, *Maguire, Wurdack & Bunting 37625* (holotype, NY). Savannas at northwest base of Cerro Yapacana, alt. 125 m, *Maguire, Cowan & Wurdack 30567, Maguire & Wurdack 34508, Maguire, Wurdack & Keith 41533* (paratypes).

COLOMBIA: Cacagual savanna, Río Atabapo, alt. 125 m, *Maguire, Wurdack & Keith 41457* (paratype).

The typical subspecies is up to 15 cm tall, with capsules 4–5.5 mm long and sepals terminated by a seta 1–2 mm long. In subsp. *venezuelensis,* the plants are (25–)35–50 cm tall, the capsules 6–7 mm long, and the sepalar setae 0.5 mm long; generally also the petals are larger, 6–6.5 mm long rather than 3–4.5 mm. The seeds of the two subspecies are alike (0.7 × 0.4 mm) and both subspecies show the same coronal structure. We have not seen the Spruce Venezuelan collection (*3513*, from the mouth of the Río Guainía) cited by Dwyer (Bull. Torrey Club **72**: 538. 1945) for *S. linearifolia;* otherwise, the typical subspecies seems limited to Minas Gerais and Goiás in Brazil. The Venezuelan subspecies in general aspect is reminiscent of *S. sprengelii* St.-Hil.

Pentaspatella ramosa Gleason.

Sauvagesia duckei Sleumer, Repert. Sp. Nov. 42: 263. 1937.

Dwyer (in Fordham University library, thesis) had proposed the transfer of *P. ramosa* to *Leitgebia;* both *L. guianensis* and *P. ramosa* have the same small inner staminodia and placentae limited to the ovary base. We feel however that the vast habital difference warrants the generic retention of *Pentaspatella;* it probably represents a distinct divergence from *Sauvagesia,* with the final floral reduction the same as in *Leitgebia.* We have examined Venezuelan material of *Pentaspatella* from the Yapacana savannas and Esmeralda Sabana Grande, as well as both topotypic (*Ducke 999*) and isotypic (*Ducke H.J.B.R. 30124,* US) material of *S. duckei* and have noted no differences between the Venezuelan and Brazilian collections. Dwyer's placentation character for *Sauvagesia* is certainly valid within the limits of our generic sampling; *S. erecta* L., *S. imthurniana* (Oliver) Dwyer, *S. sprengelii* St.-Hil., *S. nudicaulis* Maguire & Wurdack, and *S. smithiana* Dwyer all have distinct ovary wall placentae.

Adenanthe Maguire, Steyermark & Wurdack, gen. nov.

Inflorescentia paniculata; bracteis dissectis glandulosis; sepalis 5, quincuncialibus; androgynophoro androeciali cupuliformi; staminodiis 1-seriatis; staminibus 5; pistillo 2-carpellato, placentis parietalibus; capsula bivalvata; seminibus elongata alatis. Frutex; foliis alternatis; stipulis similibus aequalibus ovatis.

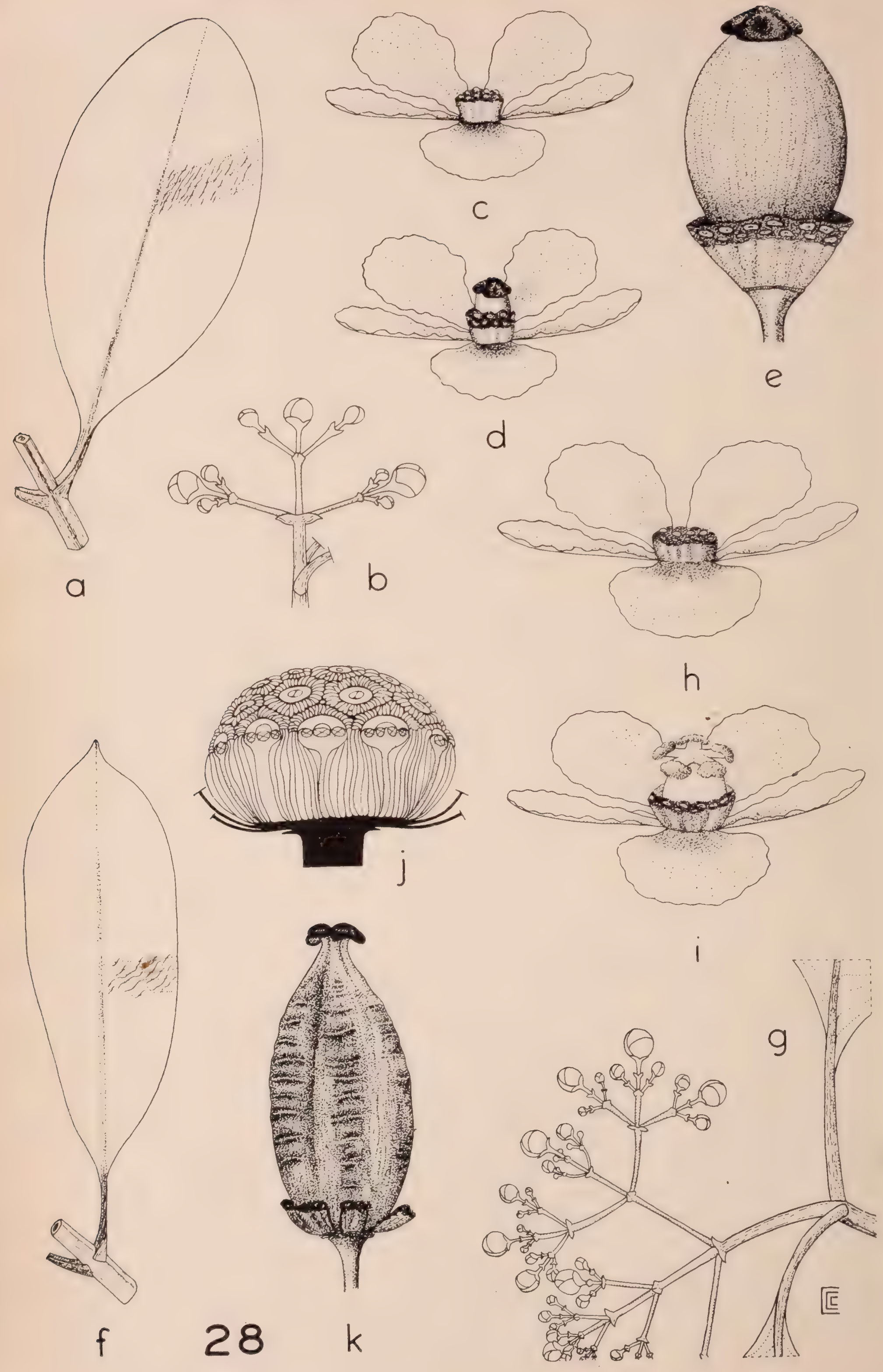
Typus: *Adenanthe bicarpellata* Maguire, Steyermark & Wurdack.

The name is from adēn, ἀδήν, gland, and anthē, ἄνθη, flower.

Adenanthe bicarpellata Maguire, Steyermark & Wurdack, sp. nov. Fig. 27 A, B.

Frutex pauciramosus 0.3–3.0 m altus; ramulis 8–10 mm diam.; foliis sessilibus saepe dense confertis, laminis ellipticis vel oblanceolatis, coriaceis, 3–11 cm longis, 1.5–4.0 cm latis, ad apicem obtusis vel acutiusculis, venis numerosis prominulis ad plus minusve 80° angulos adscendentibus; stipulis aequalibus ovatis vel lanceolatis, 1.0–1.5 cm longis, 5–7 mm latis, ovatis vel lanceolatis, acutis, caducis; inflorescentiis terminalibus paniculatis, 15–30 cm longis, ramulis lateralibus brevissimis vel 12–15 cm longis, bracteolis dissectis, glandulosis; sepalis 5, quincuncialibus ovato-lanceolatis vel lanceolatis acutis 3–5 mm latis, 8–13 mm longis, inconspicue 9–11-parallelivenatis, marginibus valde pectinate stipitato-glandulosis, stipitibus 2.5–3.5 mm longis; petalis 8–12 mm latis, 18–22 mm longis, obovatis obtusis, inconspicue punctato-glandulosis; staminodiis 10, 1-seriatis, in corona ca. 2 mm alta dispositis, staminodiis staminibus alternatis 5, anguste spathulati-oblongis, obtusis, interne ad basim carinatis, 8–9 mm longis, 1.1–1.3 mm latis, staminodiis staminibus oppositis 5, anguste lanceolatis anguste acutis, 9–10 mm longis, 0.5–0.8 mm latis; staminibus 5, subsessilibus introrse lineari-lanceolatis acutis 5–6 mm longis, ca. 1.2 mm latis, 4-thecatis, thecis posterioribus 0.2–0.3 mm productis, lateraliter dehiscentibus a poris elongatis subapicalibus; pistillis 2-carpellatis, 1-locularibus placentis parietalibus 2, ovulis numerosis; stylo subulato ca. 7–8 mm long; capsula ovata acuta, subcompressa, submembranacea, bivalvata, 8–10 mm alta, suturis non intrusis; seminibus 3.0–3.5 mm longis, plus minusve oblongis alatis alveolatis.

VENEZUELA: Bolívar: Chimantá Massif, central section, abundant and dominant around margins of savannas, swampy savanna above Summit Camp, alt. 1940 m; petals smaller than in 375-A, elliptic-oblong to ovate-oblongate, white with pink tips, inflorescence and sepals wine-red; 3 Feb 1955, *Steyermark & Wurdack 377* (holotype, NY). Chimantá-tepuí, frequent


c
e
d
a
b
h
j
i
g
f
28
k

along Caño Mojado, east of North Escarpment above upper falls, alt. 1975 m; shrub 0.3–1.5 m high, calyx mahogany-colored, petals pink, staminodia purple, open savanna form; 20 Feb 1955, *Steyermark & Wurdack 986* (paratype); frequent, summit of Torono-tepuí alt. 2167–2182 m, *Steyermark & Wurdack 626, 375A* (paratypes); rare, summit of Torono-tepuí at base of zanjones, alt. 2152 m; shrub 3–4 m high, inflorescence and leaves extremely developed as compared with depressed swampy savanna type; 21 Feb 1955, *Steyermark & Wurdack 1005* (paratype); occasional at base of escarpment, Camp 8, alt. 2050 m; shrub 3 m high, buds maroon, petals white apically pink; 23 Jan 1953, *Wurdack 34162* (paratype); northwest summit of Abácapa-tepuí, *Steyermark 7500* (paratype); Apacara-tepuí, *Steyermark 75849* (paratype).

Philacra Dwyer, Brittonia **5**:124. 1944.

Dwyer (l.c.) removed from the genus *Luxemburgia* two species, then known only by specimens collected by Tate on Cerro Duida in Amazonian Venezuela, and placed them together with a third, *P. auriculata* Dwyer, which he knew only from specimens collected by Holt and Blake in the relatively nearby Amazonian Brazil, in his new genus *Philacra.*

Our own field studies extend the known range of *P. longifolia* to Cerros Sipapo (*Maguire & Politi 28360-A*), to Cerro Parú (*Cowan & Wurdack 31071* and *31341*), and to Cerro Huachamacari (*Maguire, Cowan & Wurdack 29877* and *30323*), all in Amazonas, Venezuela, north of Cerro Duida. For the first time, *P. auriculata* Dwyer is known from Venezuela, this attractive golden-flowered shrub occurring frequently in peripheral regions of the upper montane forests of Cerro Neblina, lying some one hundred miles to the northwestward of the original locality: *Maguire, Wurdack & Bunting 37265,* and *Maguire, Wurdack & Maguire 42035, 42135* and *42187.*

GUTTIFERAE

Clusia sect. **Omphalanthera** Pl. & Tr. Ann. Sci. Nat. ser. 4. Bot. **13**: 319. 1860.

The section *Omphalanthera* was set up by Planchon and Triana to accommodate *Clusia eugenioides,* then based on a single collection, *Schlim 934,* from Santa Marta, Colombia, and even now known certainly only by that collection. To the section (as a subsection: Fl. Bras. **12**[1]: 404. 1888) Engler added *C. columnaris,* from the region of the Rio Negro where the species is abundant, and where it is now well represented in the herbaria. More recently, Cuatrecasas (Rev. Acad. Colomb. Ci. **8**: 40. 1950) has described *C. densinervia* from two collections made in the region of the Pacific Coast in Dep. Valle, Colombia. At the present writing the authors propose three additional species, for which they have considerable material, from Venezuela.

Full characterization remains impossible at this time for *C. eugenioides* and *C. densinervia.* Relationship among the six recognized species seems to be clear. On whether the species of Sect. *Omphalanthera* should be considered to represent a discrete section or should be placed in Sect. *Polythecandra* (as was done by Engler, l.c.), we must defer decision until we have a better understanding of intraspecific relationships throughout the genus.

---

[1] Type species: *Clusia eugenioides* Pl. & Tr.

FIG. 28. a–e, *Clusia brachystyla.* a, leaf and stem, habit, × 0.5. b, inflorescence, × 0.5. c, ♂ flower, × 1. d, ♀ flower, × 1. e, fruit, × 2. f–k, *Clusia gratula,* f, leaf and stem, habit, × 0.5. g, inflorescence, × 1. h, ♂ flower, × 2. i, ♀ flower, × 2. j, synandrium, × 5. k, fruit, × 2.

Sepals commonly 6, sometimes 8, paired and decussate, or less commonly 9 or 10, and then the upper imbricate; petals 5; synandrium pentagonal and columnar, or somewhat hemispheric, the filaments prismatic, connate, the anthers distal, depressed, annular or discoid; in the male flowers no vestige of a pistil present; in the female flower the anthers commonly 1–3-seriate and probably mostly functional; ovary 5-locular, the endocarp cartilaginous, commonly becoming strongly rugose at maturity; terrestrial shrub or small tree; latex clear, scanty.

Type species: *Clusia eugenioides* Pl. & Tr.

Key to the Species of *Clusia* sect. *Omphalanthera*

1. Pistil and fruit strongly rostrate.
  2. Leaves strongly petiolate.
    3. Corolla large, the petals 20–30 mm long; leaves elliptic-oblanceolate to oblanceolate, or elliptic-oblong, 10–15 cm long, 5–10 cm broad; fruit globose, to 3 cm long; stigmas sessile on the summit of the ovary; widely distributed in the valleys of the Alto Orinoco, Río Negro, and the Magdalena Valley of Venezuela and Colombia. 1. *Clusia columnaris.*
    3. Corolla small, the petals 12 mm or less long; leaves elliptic to elliptic-oblanceolate, 10–15 cm long, 4–6 (7) cm broad; fruit narrowly oblong, 15–20 cm long; stigmas borne on discrete styles 0.5–1.5 mm long; confined to the Río Pacimoni drainage, Amazonas, Venezuela. 2. *Clusia gratula.*
  2. Leaves sessile or essentially so; Upper Río Orinoco–Ventuari, Amazonas, Venezuela. 3. *Clusia annularis.*
1. Pistil and fruit not rostrate; leaves strongly petiolate.
  4. Branchlets quadrangular; leaf-blades broadly elliptic to elliptic-obovate, 10–15 cm long, 6–8 cm broad.
    5. Sepals 3 (4) pairs, decussate; mature fruit obpyriform; plants of the sandstone area of the Guayana Highland, Venezuela. 4. *Clusia brachystyla.*
    5. Sepals 9–10, the lower paired and decussate; mature fruit elliptic-oblong; plants of Pacific coastal region, Colombia. 5. *Clusia densinervia.*
  4. Branchlets terete; leaves spathulate-oblanceolate, 7–11 cm long, 3–6 cm broad; plants of the Colombian Andes. 6. *Clusia eugenioides.*

1. Clusia columnaris Engl. Fl. Bras. **12**^{1}:432. 1888.

Type: in fissuris rupium ad San Gabriel do Cachoeira ad Rio Negro, provincia do Alto Amazonas, *Spruce 1980* (G, two sheets; K; M; photos at NY.)

C. columnaris is widespread and somewhat variable in riparian and savanna and rock outcrop ecotone habitats in the basin of the Alto Orinoco, the Rio Negro, and the Magdalena. The review of some 100 sheets at The New York Botanical Garden has failed to demonstrate any clearcut geographic or ecologic varietal segregation.

Cuatrecasas (Rev. Acad. Colomb. Ci. **8**: 41. 1950) has described two varieties, viz.: *C. columnaris* Engl. var. *magdalenensis* Cuatr. from the Magdalena Valley, Colombia, *Haught 1366* (holotype F, isotype NY); and *C. columnaris* Engl. var. *vaupesana* Cuatr., from Circasia, Río Vaupes, Colombia, *Cuatrecasas 7166A* (holotype, F); and Río Guayabero, *Cuatrecasas 7555* (paratype, F). We have not been able to study sufficiently adequate series of specimens from these areas to enable us to make a critical judgment on the distinctness of these varieties.

2. Clusia gratula Maguire, sp. nov. Fig. 28 f–k.

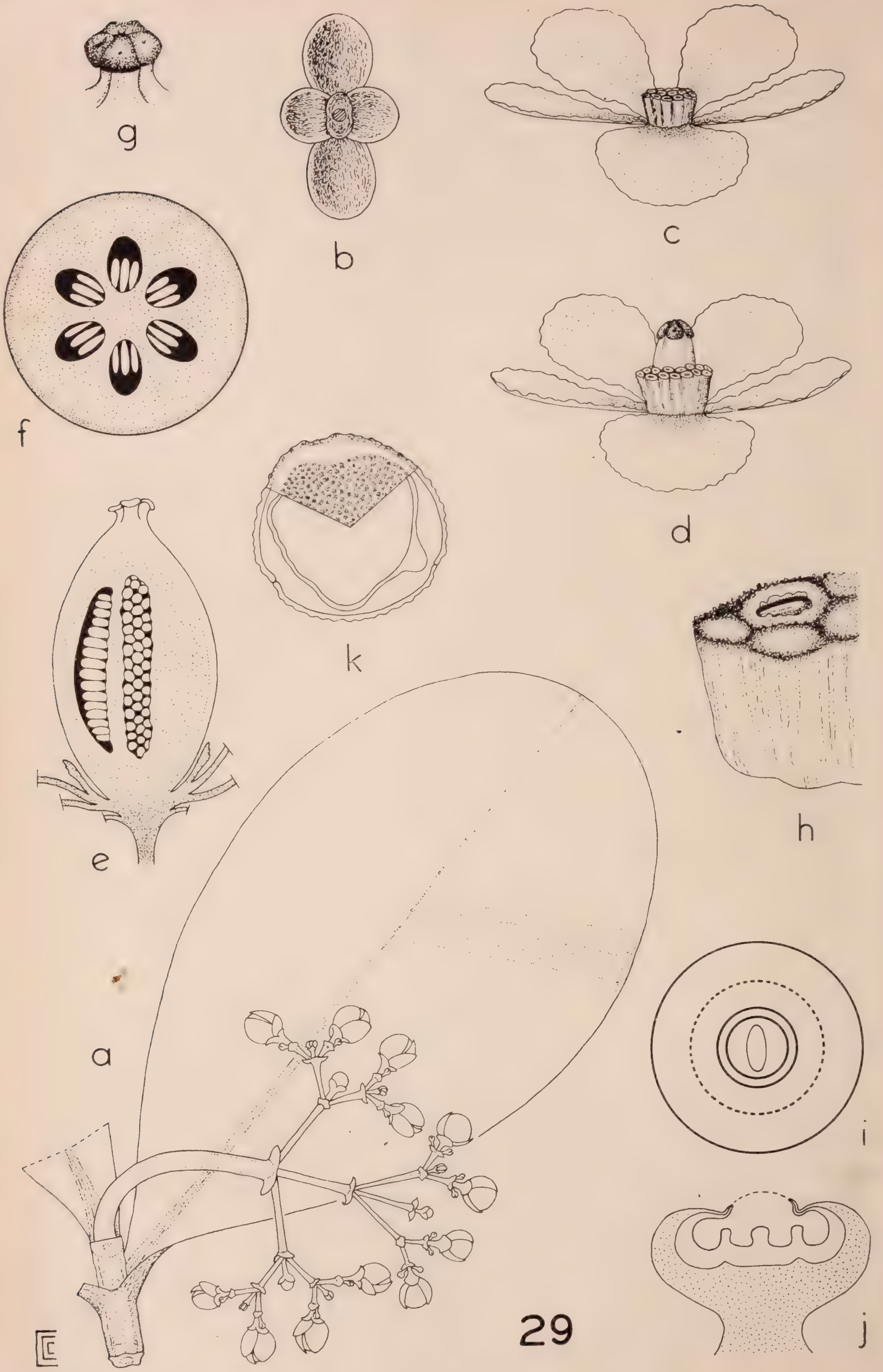
Arbor parva 5–10 m alta; ramulis teretibus 2–5 mm diam.; latice claro moderato; internodiis vulgo 2–5 cm longis; foliis valde petiolatis; laminis ellipticis vel elliptico-oblanceolatis, subchartaceis, 8–15 cm longis, 4–7 cm latis, apice acuto vel acuminato, basi acuta, costa prominenti, venis primariis prominulis vulgo 1.5–3.0 mm distantibus, ad 15°–30° adscendentibus; petiolis (1.5) 2–3 cm longis, 1.5–2.0 mm latis; inflorescentiis masculis vulgo 15–30-floribus, 4–7 cm longis, recurvatis vel reflexis, ramulis adscendentibus vel divaricatis, sepalis 3-jugis, decussatis, albidis, inferioribus late suborbicularibus ca. 2 mm longis, superioribus oblongis 5–6 mm longis; petalis 5, oblongo-obovatis, 10–12 mm longis; staminibus 20–30 in columna semisphaeroidali 2–3 mm alta connatis, thecis distaliter annularibus immersis; ovario nullo; inflorescentiis femineis vulgo 7–15-floribus; petalis 8–10 mm longis; androecio in annulo 3–4 mm alto, thecis 1–2-seriatis probabiliter fertilibus; ovario 5-loculari, stigmatibus stylis brevibus instructis; fructu oblongo, 15–20 mm longo, endocarpo valde cartilagineo, valde rugoso, rostro ca. 1 mm longo; stylis 0.5–1.5 mm longis.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Pacimoni–Yatua, frequent in *Clusia* tangle vicinity Camp III; alt. 700 m; sprawling tree 5–8 m high; latex clear, moderate; petals white with red-lacquered bases; 14 Nov 1957; *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42065* ♂ (holotype, NY); occasional, *Clusia* ''moss forest,'' vicinity Camp III; alt. 700 m; slender subscandent tree to 10 m; latex clear; sepals white, petals white with maroon centers; 23 Dec 1953, *Maguire, Wurdack & Bunting 36819* ♂; 19 Dec 1953, *36972* ♂; occasional, upper Río Yaciba (Yatua) 3–8 km below Base Camp; alt. 140 m; small riverine tree with moderate clear latex; fruit oblong, slightly pentagonal, pellucid-white, flushed red, stigmas white, short-beaked; 30 Jan 1954, *Maguire, Wurdack & Bunting 37437* ♀, *37425* ♀; *Clusia* tangle south Camp III; alt. 700 m; 14–16 Nov 1957, *Maguire, Wurdack & Maguire 42066* ♀; 5 Jan 1958, *42600* ♀; Cañon Grande; alt. 1100 m; 24 Nov 1957, *Maguire, Wurdack & Maguire 42208* ♀; 24 Dec 1957, *42477* ♂ (paratypes).

Clusia gratula with dainty (hence the epithet), diminutive flowers, so far as collected confined to Cerro de la Neblina and the piedmont streams, is obviously closely related to and probably derived from *C. columnaris*, a common riverine and low-altitude rock-exposure species of black-water streams in the upper Rio Negro drainage. The presumptive derivative, *C. gratula*, differs decisively from *C. columnaris* in its leaves of different form and texture, its consistently smaller flowers and fruit, and the development of discrete styles.

3. Clusia annularis Maguire, sp. nov. Fig. 29.

Arbor parva 4–10 m alta; ramulis crassis vulgo ca. 1 cm diam., subsucculentibus, nodis 1–2 cm distantibus; foliis sessilibus vel subsessilibus, laminis late obovatis, coriaceis, vulgo 15–20 cm longis, 10–15 cm latis, apice late obtuso vel rotundato, basi obtusiuscula, costa prominenti, venis primariis prominulis 2–6 mm distantibus, angulo 20–30° adscendentibus, canalibus laticiferis plus minusve evidentibus, angulo 70–90° adscendentibus; inflorescentiis masculis amplis ad 20 cm longas 7–21-floribus, vulgo recurvatis; floribus masculis: sepalis 3-jugatis albidis, inferioribus reniformibus 2–4 mm longis, superioribus orbicularibus vel late oblongo-obovatis, ad 15 mm longa; petalis 5, spathulati-obovatis, 2–3 cm longis, 1.5–2.0 cm latis; staminibus vulgo 20–30, in columna prismatica 3–5 mm alta connatis, thecis distaliter orbicularibus annularibus vel disciformibus immersis, ovario nullo; inflorescentiis foemineis 3–9-floribus; floribus foemineis: sepalis 6–8, petalis 5, androeciis annuliformibus, annulis 3–4 mm altis; stamini-


g
b
c
f
d
k
e
h
a
i
j

29

bus vulgo 15–25, vulgo 2-seriatis, thecis fertilibus; ovario 5-loculari, ovulis 2–3-seriatis, stigmatibus 5, sessilibus, umbraculiformibus; fructu oblongo ca. 3 cm longo, endocarpo cartilagineo, non evidenter rugoso, rostro 2–4 mm longo.

VENEZUELA: Amazonas: Río Ventuari, frequent, dry open eastern slopes Cerro Moriche; alt. 1000 m; small tree to 5 m high; petals 5, white with lacquer-red centers; 15 Jan 1951, *Bassett Maguire, R. S. Cowan & J. J. Wurdack 30848* (holotype, NY). Cerro Yapacana, Río Orinoco, frequent on cumbre; alt. 1200 m; tree 8 m high; sepals 6, white; petals 5, white with lacquer-red base; androecium compact, columnar, base red; 3 Jan 1951, *Maguire, Cowan & Wurdack 30666* ♂. Cerro Moriche; tree 3–10 m high; sepals 8; 13 Jan 1951, *Maguire, Cowan & Wurdack 30851* ♀. Cerro Yapacana, *Maguire, Cowan & Wurdack 30667* ♀, *30730* ♂, *30732* ♀, *37033* ♀; Cerro Moriche, *Maguire, Cowan & Wurdack 30962* ♂, *30963* ♀ (paratypes).

One collection, *Maguire & Politi 28666* ♀, collected on Cerro Sipapo, Amazonas, Venezuela, at 2100 m, 27 Jan 1949, is to be referred to *C. annularis*, but its leaves are narrower and the apex obtusish only. This collection may represent a geographic and ecologic variant.

4. **Clusia brachystyla** Maguire, sp. nov. Fig. 28 a–e.

Arbor parva; ramulis quadrangularibus; latice claro exiguo; foliis valde petiolatis, laminis vulgo elliptico-obovatis, coriaceis; inflorescentiis masculis 7–15-floribus; sepalis 3 (–4) jugis, albidis; petalis 5 panduriformibus albidis vel roseis, ad basim rubris, vel rare petalis omnino albis; androecio in massa centrali coalescenti, ovario absenti absolute; staminibus 30–40 in columna pentagonali 3–5 mm alta connatis; thecis distaliter annularibus immersis; inflorescentiis foemineis vulgo 3–7-floribus, androecio in annulo 3–5 mm alto, thecis 1–2-seriatis, probabiliter saepe fertilibus; ovario 5-loculari, ovulis numerosis 3-seriatis, rostro defecto, stigmatibus 5, sessilibus; fructibus obpyriformibus, ad 5.5 cm longos, 3.5 cm diam., valde transverse rugulosis.

Key to the Varieties of *Clusia brachystyla*

1. Leaves subcoriaceous, commonly exceeding 12 cm in length, pale beneath; mature fruit ca. 3 cm long, the stigmas hemispheric-umbraculiform, 8–10 mm in diameter at maturity. var. *brachystyla*.
1. Leaves coriaceous, commonly under 12 cm in length, reddish-brown beneath; mature fruit ca. 5 cm long, the stigmas flat, 15–20 mm in diameter at maturity. var. *guaiquinimensis*.

Clusia brachystyla var. **brachystyla**.

Branchlets moderately quadrangular; leaf-blades obovate to elliptic-obovate or oblanceolate, obtuse or abruptly acute, 10–20 cm long, 5–10 cm broad; mature fruit obpyriform, strongly rugose, to 3 cm long; stigmas hemispheric-umbraculiform, 8–10 mm in diameter.

VENEZUELA: Bolívar: vicinity of Misión Santa Teresita de Kavanayén; occasional, forested slopes below south rim of savanna plateau, alt. 1200 m; savannas; 11 Dec 1952, *Bassett Maguire & John J. Wurdack 33754* ♂ (holotype, NY); woodland slopes southeast of Kavanayén Mission, alt. 1400 m; 30 Mar 1952, *Maguire 33707* ♀ (paratype). Ptari-tepuí; alt. 1600 m; 10-11 Nov 1944, *Steyermark 59992* ♂ (NY). Arabupu, Mt Roraima; 21 Jan 1939, *Pinkus 173* ♂. Amazonas: Río Cunucunuma, frequent, trail ascending Cerro Duida; alt. 800 m; small tree 10 m high, petals white with red centers; 25 Nov 1950, *Maguire, Cowan & Wurdack*

FIG. 29. a-k, *Clusia annularis*. a, leaf and inflorescence, habit, × 0.5. b, sepals, dorsal view, × 1. c, ♂ flower, × 1. d, ♀ flower, × 1. e, tangential section through fruit, × 1. f, cross section of fruit, × 1.5. g, stigma, × 2. h, portion of synandrium, × 7. i, diagram of face view of anther, × 15. j, diagram of median long section through stamen, × 15. k, pollen grain, × 900.

29727 ♂ (paratype). Cerro Sipapo; alt. 500 m; *Maguire & Politi 28718* ♀; Danta Falls, Río Cuao, *Maguire & Politi 29037* ♀; Cerro Marahuaca, *Maguire & Maguire 29138* ♀, *29142* ♀, *29220* ♀; Cerro Duida; *Maguire, Cowan & Wurdack 29276* ♀, *29582* ♀, *29583* ♂, *29586* ♂, *29587* ♀, *29601* ♀, *29726* ♀, *29727* ♂, *29728* ♂, *29740* ♀; Serranía Parú; *Cowan & Wurdack 31457* ♂, *31463* ♂, *31489* ♂, *31452* ♀; Serrania Yutaje, Río Manapiare; *Maguire & Maguire 35078, 35105* ♀, *35115* ♂, *35366* ♂, *35426* ♂; Cerro Duida, *Tate 790* ♀ (NY); Cerro Yaví; *Phelps & Hitchcock 21* ♀ (NY); Serranía Parú; *Phelps & Hitchcock s. n.* ♀ (NY).

BRITISH GUIANA: Pakaraima Mountains: Imbaimadai Savannas, Upper Mazaruni River; alt. 1300 m; 24 Oct 1951, *Maguire & Fanshawe 32237* ♂; 25 Oct 1951, *Maguire & Fanshawe 32293* ♂.

Clusia brachystyla var. **guaiquinimensis** Maguire, var. nov.

Ramulis valde acute quadrangularibus; laminis obovatis vel elliptico-obovatis, vulgo 8–10 (12) cm longis, vulgo abrupte acuminatis, rubro-brunneis subtus; fructu maturo obpyriformi valde transverse rugoso, 5–6 cm longo; stigmatibus 5, planis, 15–20 mm diam.

VENEZUELA: Bolívar: Cerro Guaiquinima, occasional along open watercourse, North Valley; alt. 1600–1700 m; tree 10 m high, stems sharply 4-angled; latex clear, yellowish, scanty; petals pink or rose with lacquer-red centers; stigmas 5, sessile; fruit oblong, 6–7 cm long, 3–4 cm broad; *Bassett Maguire 33097* ♀ (holotype NY); North Valley, alt. 1600–1700 m; bushy tree 8 m high; latex scanty, clear, yellowish; sepals 3 pairs, white; petals 5, outside white, inside deep pink or rose, lacquer-red at base; *Maguire 33058* ♂ (paratype); Cerro Guaiquinima; *Maguire 32947* ♂, *33059* ♀, *33105* ♀; Sororopán-tepuí, *Maguire & Wurdack 33804* ♂; Chimantá-tepuí; *Steyermark 75200* ♀ (NY), *75624* ♂ (NY), *Steyermark & Wurdack 1358* ♀.

5. **Clusia densinervia** Cuatr. Rev. Acad. Colomb. Ci. **8**:40. 1950.

COLOMBIA: Valle: Puerto Merizalde, Costa del Pacífico, Río Naya; bosques; alt. 5–10 m; *Cuatrecasas 14025* (type, NY, US). San Isidro, Río Cajambre; *Cuatrecasas 17289* (paratype, F, NY, US).

The type collection represents immature flowering male material. The larger number of sepals (9–10) of the flower buds seems to represent a distinct departure from the prevailing number in the sect. *Omphalanthera* (usually 6). The fruiting specimens of the paratype indicate close relationship with *C. brachystyla* of Venezuela, and perhaps with the poorly known *C. eugenioides* of Colombia.

6. **Clusia eugenioides** Planch. & Lind. Mem. Guttif. Ann. Sci. Nat. ser 4. Bot. **13**:328. 1860

Known certainly only by the type collection, *Schlim 934*, from 4000 ft alt., Santa Marta (holotype P, isotypes Herb. Boissier G, Herb. Delessert G).

Three other collections have tentatively been assigned to *C. eugenioides*, viz., Dolores, Tolima, Colombia, 1300–1700 m, *Lehmann 7302* (K 3 sheets, US); climbing shrub, flowers showy, white, with slight rose flush, on fallen tree, at 750 m alt., Quebrada Bruno, Comisaria Goajira, Colombia, 26 Aug 1944, *Haught 4329* (NY, US); tree 60–80 ft. high, flowers dark pink, thick forest at bank-side, El Umbo region, Mt. Chapon, extreme western part of Dep. Boyaca, northwest of Bogotá, Colombia, 25 Sep 1932, *Lawrance 473* (NY).

The four collections cited here bear some similarity in general facies. Collectors' notes indicate considerable differences in habit. Geographical disposition of the four collections raises further question of their conspecificity. Not improbably a species-complex is represented among even these few specimens. Until considerably more material is at hand, any specific delimitation within the complex is impractical.

Quapoya Aublet, Hist Pl. Guiane Fr. **2**:898. 1775.

Rengifa Poeppig in Poeppig & Endlicher, Nov. Gen. & Sp. **3**: 12. *pl. 210.* 1840.

Dioecious; bracts decussate, often numerous, immediately subtending the sepals; petals 5, small, often vittate; in the staminate flower stamens 10, coalesced in a central umbraculiform mass, the anthers free, radiate and recurved, the thecae linear-oblong, lateral, laterally dehiscing; ovary completely lacking; in the pistillate flower staminodia 5, free, complanate, erect, or lacking, the ovary 5-locular, the ovules 2-seriate, the stigmas 5; fruit oblong-globular or oblong, baccate; stigmas 5, distinct, disciform, somewhat elevated; seed narrowly oblong, acute or acutish at both ends.

Small trees, scandent shrubs or woody vines, apparently confined to rainforest areas, distributed broadly in the Amazon headwaters and hylea north of the Amazon.

Type species: *Quapoya scandens* Aublet.

The genus is distinctly marked by the umbraculiform androecium of the staminate flowers. This remarkable structure, superficially somewhat resembling the antheridium of the liverwort *Marchantia*, is unique. Otherwise, *Quapoya* would be indistinguishable from *Clusia*.

Key to the Species of *Quapoya*

1. Leaves obtuse or rounded at the apex, coriaceous.
    2. Midrib extended ca. ⅔ the length of the blade; blades broadly obovate, 8–10 cm long, abruptly short-pointed; petiole 7 mm or less long. 1. *Quapoya scandens.*
    2. Midrib extended nearly the full length of the blade; apex rounded, not abruptly short-pointed; petiole 10 mm or longer.
        3. Leaf-blades obovate to oblanceolate; primary lateral veins improminulous, but discernible; sepals 6, in 3 decussate pairs. 2. *Quapoya sipapoana.*
        3. Leaf-blades oblong to elliptic-oblong; primary lateral veins hardly discernible; sepals 15–17. 3. *Quapoya froesii.*
1. Leaves acuminate at the apex, subcoriaceous.
    4. Paired bracts subtending flower numerous; branches of inflorescence less than 2 cm long; superior sepals 2.5–3.0 mm long; plants of coastal Guiana. 4. *Quapoya bracteolata.*
    4. Bracts subtending flower a single pair; branches of inflorescence divaricate, commonly exceeding 2 cm in length; superior sepals ca. 5 mm long; plants of the Upper Amazon watershed. 5. *Quapoya peruviana.*

1. Quapoya scandens Aublet, Hist. Pl. Guiane Fr. **2**:898. *pl. 433.* 1775.

Rengifa scandens (Aublet) Planchon & Triana, Ann. Sci. Nat. ser. 4. Bot. **14**: 241. 1860. Cayenne in 1775, *Aublet s.n.* (holotype BM, photo NY).

Additional specimens examined: French Guiana: Godebert, 23 Jun 1921, *Wachenheim 292* (NY); *Melinon* in 1862, *389, 449* (P); *Melinon s.n.* (P).

Though a well-marked species, *Q. scandens* has been little collected, and its distribution is not well known. It is to be expected that it will be found in much of coastal Guiana.

2. Quapoya sipapoana Maguire, sp. nov. Fig. 30 A–H.

Arbor parva; ramulis 3–4 mm diam., plus-minusve teretibus, conspicue rimosis; foliis oppositis, petiolatis, laminis obovatis vel oblanceolatis, coriaceis, vulgo 10–15 cm longis, 5–8 cm latis, ad apicem rotundatis obtusis, ad basim obtusiusculis, acutis, venis primariis improminulis, 3–7 mm separatis, ad plus-minusve 45° adscendentibus; canalibus laticiferis ad 70-80° adscendentibus, subtus glanduloso-punctatis; petiolis 12–20 mm longis; inflorescentiis

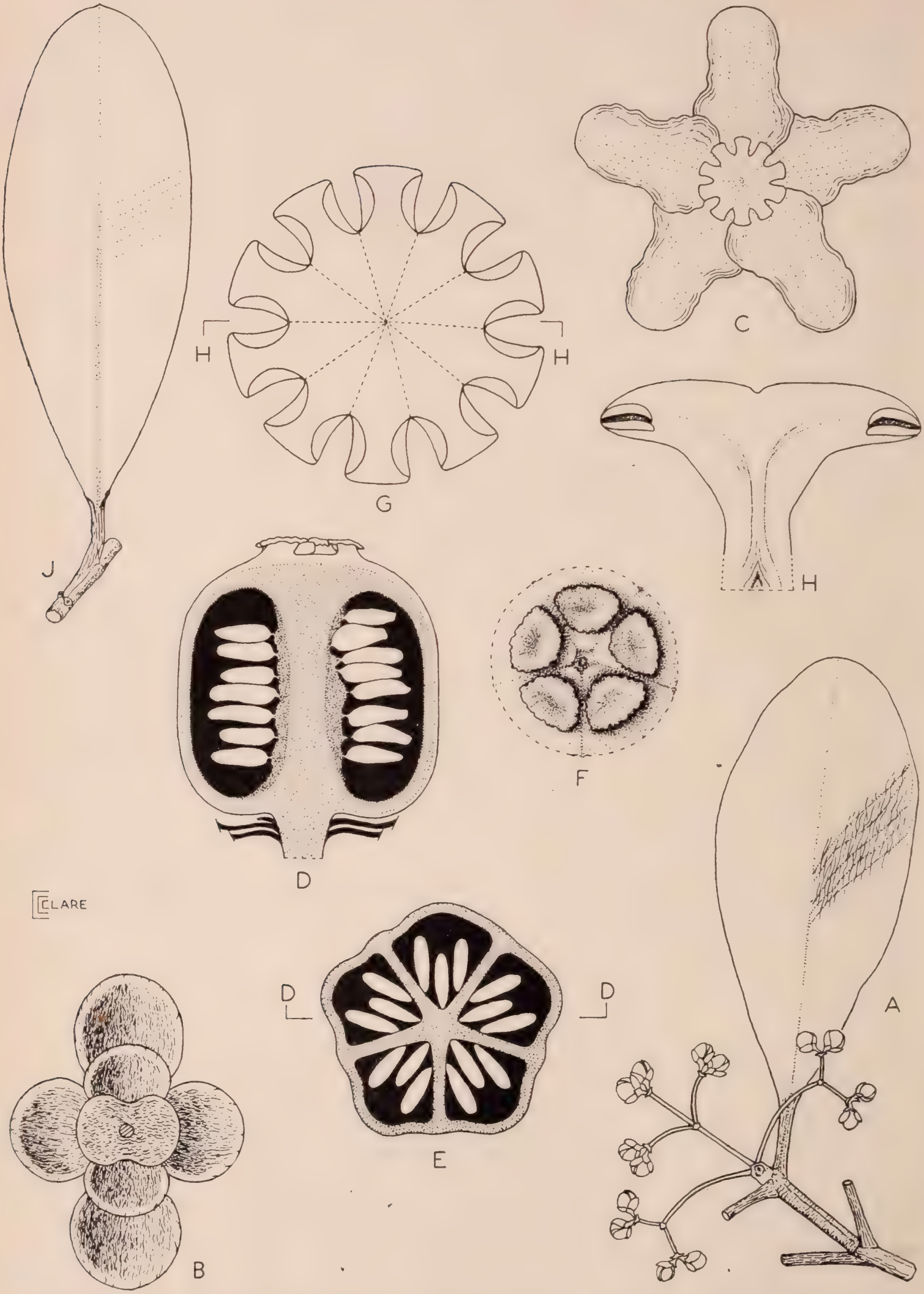


FIG. 30. A–H, *Quapoya sipapoana*. A, leaf, habit, × 0.5. B, dorsal view, sepals, × 2. C, ♂ flower, × 4. D, long median section, fruit, × 3. E, cross section, fruit × 3. **F,** top view, stigmas, × 6.25. G, top view of synandrium, × 10. H, vertical median section of synandrium, × 10. J, *Quapoya froesii;* leaf, habit, × 0.375

masculinis paniculatis, ramulis primariis vulgo 3, 2–3 cm longis, recurvatis vel divaricatis, secondariis 1.0–1.5 cm longis, divaricatis, vulgo 3-floribus per ramum; bracteis ca. 1.5 mm longis; sepalis carneis, 3-jugis, decussatis, orbicularibus, cupulatis, superioribus 4–5 mm longis; petalis 5, carneis, oblongis vel panduriformibus, punctatis, ad marginem vulgo vittatis, ad basim 4–5 mm latis, 7–8 mm longis; staminibus 10 ad basim coalitis, supra in orbe horizontaliter radiatis, thecis lineari-oblongis lateraliter dispositis, dehiscentibusque, ovario nullo; inflorescentiis foemineis evidenter paucifloribus, sepalis et petalis ut in floribus masculis, staminodiis nullis, ovario 5-loculari, ovulis 2-seriatis; fructibus baccatis, oblongo-ovalibus, ca. 15 mm longis; stigmatibus 5, orbicularibus, ca. 1 mm diam., distincte separatis, breviter elevatis; seminibus tenuiter subfusiformi-oblongis.

VENEZULA: Amazonas: Cerro Sipapo; occasional in mixed forest, north escarpment; alt. 1400 m; small tree; 23 Dec 1948, *Bassett Maguire & Louis Politi 27868* ♂ (holotype, NY). Woodland, intermediate Camp, alt. 600 m; 27 Nov 1948, *Maquire & Politi 27468* ♂; 2 Feb 1949, *28738* ♀ (paratypes); Caño Profundo, woodland, alt. 1600 m; small tree; 10 Jan 1949, *Maguire & Politi 28268A* ♂ (paratype). Cerro Arauicaua, Río Yatua; 3 Feb 1954, *Maguire, Wurdack & Bunting 37470* ♀, *37467* ♀. Piedra Tururumeri, Río Yatua; alt. 110–220 m; occasional; 4 Feb 1954, *Maguire, Wurdack & Bunting 37488* ♀; Cerro de la Neblina, vic. Camp III; alt. 650–700 m; 30 Dec 1957, *Maguire, Wurdack & Maguire 42659* ♀.

3. **Quapoya froesii** Maguire, sp. nov. Fig. 30 J.

Laminis crassulis, oblongis vel elliptico-oblongis, 12–18 cm longis, 5–7 cm latis, apice obtuso, basi acutiuscula; costa prominenti; venis impercepte improminulis, canalibus laticiferis superficialiter non manifestis; petiolis ca. 1.5 cm longis; inflorescentiis masculis non visis; inflorescentiis foemineis recurvatis, ca. 6 cm longis, ramis primariis divaricatis; floribus immaturis, sepalis 15–17, inferioribus crassulis 4-jugatis decussatis, ad 2.5 mm longa, superioribus subimbricatis ad 3 mm longa, omnibus obtusis; petalis 5, stigmatibus 5, staminodiis destitutis.

BRAZIL: Amazonas: high central forest, Igarape Jandistuba, S. Paolo de Olivenca, Rio Solimoes; 2 Feb 1949, *R. L. Froes 24060* ♀ (holotype, NY).

Unfortunately, *Quapoya froesii* is represented by but a single pistillate collection of which the flowers are immature. The bracts and sepals most nearly resemble those of the Guiana *Q. bracteolata* Sandw.; and next to those of *Q. peruviana* (P. & E.) O. Kuntze.

The collector describes the plant obtained by him in the field as a ''strangler on top [of] very high trees, [with] white rosy fragrant flowers.''

4. **Quapoya bracteolata** Sandwith, Kew Bull. **1931**: 177. 1931.

Rengifa acuminata Planchon & Triana, Ann. Sci. Nat. ser. 4. Bot. **16**: 243. 1860.
Quapoya acuminata Kuntze, Rev. Gen. 61. 1891; not *Q. acuminata* Walp. Repert. **1**: 393. 1842. (=*Clusia acuminata* Sprengel, Syst. Veg. **2**: 599. 1825).
Renggeria montana Klotzsch in Schomb. Reisen **3**: 1093. 1848; nomen.

Type: ''Roraima, Brit. Guiana, 1842-3,'' *Schomburgk 999* (holotype, P; isotypes, G, K, NY, W).

So far as collected, *Q. bracteolata* occurs only in low-altitude rain-forests of British Guiana. The notation ''Roraima'' on the original Schomburgk label must be held suspect.

Although characteristically numerous decussate bracteoles subtend the flowers, principally the staminate flowers, some specimens, notably *Jenman*

4059 from the Upper Demerara River, are provided with few (1–3) pairs of bracteoles. Such plants may represent a minor variety.

5. Quapoya peruviana (Poeppig & Endlicher) Kuntze, Rev. Gen. **1**:61. 1891.

Rengifa peruviana Poeppig in Poeppig & Endlicher, Nov. Gen. et Sp. **3**: 12. *pl. 210.* 1840.

The original material and more recently collected materials from Peru, Ecuador, and the headwater region of Amazonian Brazil and Amazonian Colombia, are consistent with respect to a large (6–10 cm long) divaricate inflorescence and general form of leaf.

Dr Cuatrecasas has recognized as var. *occidentalis* specimens from the Pacific Coast region (Valle) of Colombia, characterized by him as having somewhat larger flowers, more robust pedicels, and shorter inflorescences than the var. *peruviana.* Foliar differences indicated by Cuatrecasas do not seem to hold.

There has now accumulated a series of collections from the Río Negro—Alto Río Orinoco drainages that have the shorter inflorescences but perhaps somewhat smaller flowers than var. *occidentalis.* They do seem to be recognizable by distinctly white scarious margins abruptly set off from the body of the sepals by a definite costulate line. They are here interpreted as a third minor geographic variant.

Undoubtedly the above specific assemblage is closely related to the Atlantic Coastal *Q. bracteolata* and may some day have to be associated with it.

Key to the Varieties of *Quapoya peruviana*

1. Inflorescence 6–10 cm long; superior sepals 3(4) mm long; neither petals nor sepals vittate; subtending bracteoles somewhat disjunct, 1–2 pairs. 1. var. *peruviana.*
1. Inflorescence 3–5 (6) cm long, the subtending bracteoles little disjunct; sepals and petals vittate.
    2. Superior sepals 4.0–4.5 mm long, their margins gradually scarious; inflorescence open, the subtending bracteoles often of but 1 or 2 pairs. 2. var. *occidentalis.*
    2. Superior sepals 2.5–3.5 mm long, abruptly marginally costulate and white-scarious-margined; inflorescence often more congested, the subtending bracteoles often 2–3 pairs. 3. var. *guayanensis.*

1. Quapoya peruviana var. **peruviana.**

PERU: *Poeppig* (type, Herb. Boissier, G). Huanuco: confluence of Rio Huallaga with Río Cayumba; 16 Oct 1936, *Mexia 8289* (NY).

BRAZIL: Amazonas: São Paolo de Olivenca, near Palmares, Rio Solimoes; *Krukoff 8320, 8517* (NY).

COLOMBIA: Amazonas: trapecio region between Amazon and Putumayo watersheds; *Schultes 6762* (NY).

2. Quapoya peruviana var. **occidentalis** Cuatrecasas, Anal. Inst. Biol. México **20**:112. 1949.

COLOMBIA: Valle: Río Yurumangui, bosque, alt. 5–50 m; gran bejuco; flor blanco; 3 Feb 1944, *J. Cuatrecasas 15889* (holotype, F; isotype, NY). Buenaventura Bay; 16 Feb 1939, *Killip & Garcia 3352* (NY). Region Choco, Río Calima; 23 Mai 1946, *Cuatrecasas 21255* (NY).

3. Quapoya peruviana var. **guayanensis** Maguire, var. nov.

Inflorescentiis vulgo 3–5 cm longis, paucifloribus; ramis inflorescentiarum divaricatis; bracteolis floribus subtendentibus saepe 2–3-jugatis; sepalis superioribus orbicularibus 3.0–4.0 mm longis, in maturitate marginaliter costulatis et abrupte albo-scariosis; petalis orbiculari-oblongis vel oblongis, 5–6 mm longis,

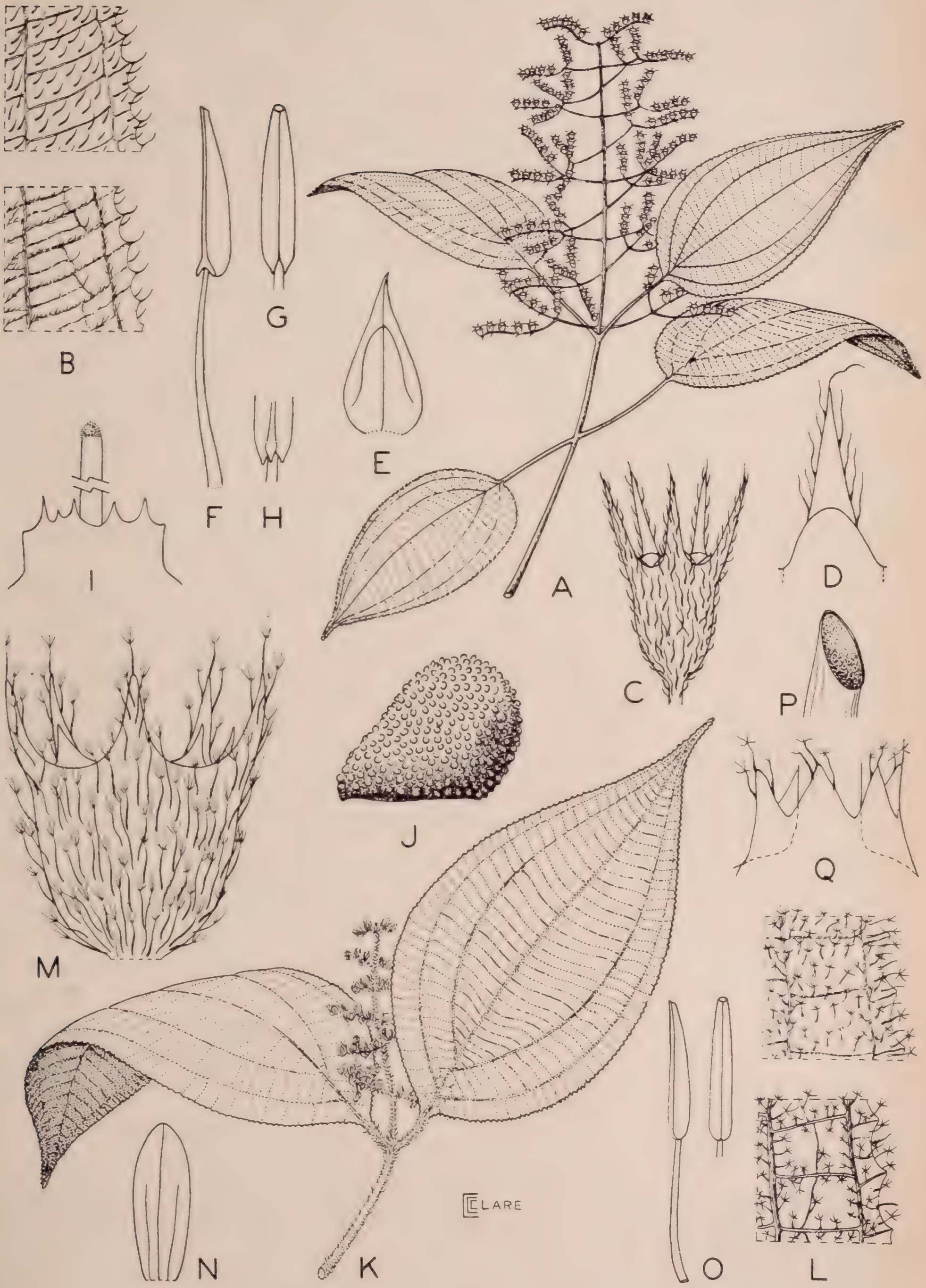


FIG. 31. A–J, *Leandra longisepala.* A, habit, × 0.25. B, detail of upper and lower leaf surfaces, × 2. C, hypanthium plus calyx, × 5. D, sepal and exterior tooth from inside, × 10. E, petal, × 7.5. F–H, stamen in lateral, ventral, and dorsal views, × 10. I, ovary apex, style, and stigma, × 20. J, seed, × 50. K–Q, *Miconia fanshawei.* K, habit, × 0.25. L, upper and lower leaf surface detail, × 2. M, hypanthium plus calyx, × 10. N, petal, × 7.5. O, stamen, lateral and ventral views, × 10. P, stigma, × 25. Q, ovary apex, × 25.

paucivittatis; florum foemineorum staminodiis 5, thecis lateralibus distalibusque, evidenter mox caducis; ovario 5-loculari, ovulis 2-seriatis; stigmatibus 5.

VENEZUELA: Amazonas: Cerro de la Neblina, occasional in high mixed montane forest, 2–8 km south Camp III, alt. 900 m; woody vine with scanty pale latex; 24 Dec 1953, *Bassett Maguire, John J. Wurdack & George Bunting 36881* ♂ (holotype, NY); *Maguire, Wurdack & Bunting 37386* ♂; *Maguire, Wurdack & Maguire 41779* ♀ (paratypes); *Maguire, Wurdack & Bunting 36732* ♂; *Maguire, Wurdack & Maguire 41788A* ♀, *42579*.

MELASTOMATACEAE

Leandra longisepala Wurdack, sp. nov. Fig. 31, A–J.

Inter congeneros sectionis cum conjunctione foliorum submagnorum paulo pubescentiumque et sepalorum magnorum bene distincta.

Sect. *Secundiflorae.* Rami cum petiolis inflorescentiisque dense subsericeo-strigosi pilis laevibus ca. 1 mm longis. Petioli 3–7 cm longi; lamina membranacea 9–17 × 4–9 cm ovata apice anguste acuminata basi rotundata ad margines distincte serrata dentibus ca. 6/cm et ca. 1 mm profundis singulis unisetosis seta 1–2 mm longa, breviter 7-plinervata jugo interiore 6–11 mm supra basim inserto jugis exterioribus ad basim ipsam insertis nervis secundariis ca 4–5 mm inter se distantibus nervis omnibus supra planis subtus graciliter elevatis, supra sparse strigulosa pilis ca. 1 mm longis et 3–4/mm,^{2} subtus in venis venulisque modice strigulosa sed in superficie glabra. Inflorescentia ca. 12–17 cm longa cum ramis arcuato-divaricatis ad 8 cm longis secundifloris. Flores inter se satis distantes sessiles 5-meri; bracteolae persistentes 2.5–3 × 0.3–0.5 mm lineares setulosae. Hypanthium (ad torum) 2.3–2.5 mm altum densiuscule strigulosum pilis eglandulosis plerumque 0.7–1 mm longis et modice cum glandulis clavatis sessilibus vix 0.1 mm longis obsitum. Calycis tubus 1 mm altus, dentibus interioribus ovatis rotundatis 1 mm altis, dentibus exterioribus ca. 2.5 mm longis oblongo-lanceolatis anguste acutis extus et ad margines setulosis setis 0.5–0.7 mm longis. Petala 3.6–3.8 × 1.5–1.6 mm ovata apice anguste acuminata. Stamina in magnitudine vix dimorphica sed in forma isomorphica; filamenta 2.9–3.3 mm longa; antherae 2.4–2.6 mm longae anguste oblongae apice minute uniporosae (poro 0.15 mm diam.), connectivo basi postice unicalcarato calcare 0.2 mm longo. Stylus 6 × 0.3 mm; stigma punctiforme; ovarium triloculare apice glabrum et in collum ca. 0.4 mm altum circum stylum protractum dentibus irregularibus subsetulosis; bacca ca. 6–7 mm diam., seminibus 0.5 × 0.35 mm leviter denseque tuberculatis.

VENEZUELA: Amazonas: Cerro de la Neblina, occasional on slopes just below escarpment east of Camp 3, alt. 1600–1700 m; shrub 1.5–2.5 m, inflorescence branches pale pink, petals pale translucent pink, stamens pale yellow, fruit deep purple; 27 Dec 1953, *Maguire, Wurdack & Bunting 36914* (holotype, NY).

Among the 5-merous species of *Leandra* sect. *Secundiflorae*, only *L. francavillana* Cogn. and *L. longicoma* Cogn. approach *L. longisepala* in sepalar dimensions; the former species has leaf blades beneath densely sericeous as well as crowded flowers, while the latter has spreading longer stem, inflorescence, foliar, and hypanthial hairs.

Miconia pseudocapsularis Wurdack, sp. nov.

M. lateriflorae Cogn. affinis sed cum foliis plinervatis inflorescentiae ramis secundifloris floribus plerumque 5-meris connectivo antice distincte prolongato.

Frutex vel arbor parva usque ad 10 m inflorescentia excepta glabra; ramuli teretes. Folia aequalia vel vix inaequalia; petioli 1–7 cm longi; lamina membranacea (6–)12–21 (acumine excluso) × (2.5–)5.5–12 cm apice subabrupte acuminata acumine 1–2 cm longo basi cuneata 5-plinervata nervis omnino supra subplanis subtus graciliter elevatis nervis primariis per paria plerumque vix inaequaliter insertis nervis secundariis plerumque 5–10 mm inter se distantibus nervulis laxe reticulatis, ad margines integra vel inconspicue crenulata. Inflorescentia inconspicue furfuracea usque ad 10 cm alta cum ramis longis divaricatis secundifloris; bracteolis 0.3 mm longis ovatis caducis; flores 5-meri glabri breviter (0.5 mm) pedicellati. Hypanthium (ad torum) 2.2–2.5 mm altum anguste oblongum; calycis tubus vix 0.1–0.2 mm altus, lobis interioribus 0.4–0.6 mm altis ovatis apice obtusis, dentibus exterioribus acutis non eminentibus. Petala 1.8–2 × 1.1–1.2 mm obovata apice oblique retusa. Stamina isomorphica; filamenta 3 mm longa; antherarum thecae 3 mm longae curvatae subulatae, connectivo postice exappendiculato vel inconspicue calcarato antice sub insertione filamenti 0.4 mm prolongato appendice extremitate 0.1–0.15 mm hebeti-bilobulato. Stylus 7.5 × 0.25 mm; stigma truncatum 0.3 mm diam.; ovarium 3-loculare vix inferum glabrum apice 0.3 mm excavatum et indistincte trilobulatum; bacca i.s. valde 10-costata ca. 4 mm longa; semina 0.4–0.5 mm longa tuberculata.

VENEZUELA: Amazonas: Cerro de la Neblina, abundant in talus forest between Camps 3 and 4, alt. 1000–1200 m; shrub 2–5 m, flowers white, young fruit greenish; 9 Nov 1957, *Maguire, Wurdack & Maguire 42015* (holotype, NY); talus forest of Cerro de la Neblina, *Maguire, Wurdack & Maguire 42004* (paratype); talus forest of Cerro Huachamacari, alt. 1100 m, *Maguire, Cowan & Wurdack 29827* (paratype); slopes of Caño Negro, alt. 305–1095 m, Cerro Duida, *Steyermark 57977* (paratype).

The closest relative of *M. pseudocapsularis* is an undescribed species from the Gran Sabana and Tafelberg, having the paniculate inflorescence of *M. lateriflora* but the plinerved leaves and 5-merous flowers of the Terr. Amazonas species. The fresh fruit of *M. pseudocapsularis* is a spherical translucent white to pale orange berry with high water content; the dried fruit simulates a capsule to such an extent that Dr. Gleason, unable to determine the Steyermark fruiting collection, noted that it might represent an undescribed genus of the *Bertolonieae*.

In updating Dr. Gleason's manuscript of the *Melastomataceae* of Panama, I introduced without comment the synonymization of *M. disparilis* (Standl.) R. O. Williams under *M. lateriflora;* the basis for this synonymy has been the examination of *Baker 116* (MG 9368), from Marco, Pará, Brazil. The species is known from Central America to the Amazon Valley and has been recently collected several times in Pará; *Froes 23810* (NY), from the Rio Solimões, is an exact duplicate of Baker's collection.

Miconia yatuensis Wurdack, sp. nov. Fig. 32, A–E.

M. lateriflorae Cogn. affinis, sed cum ramulis dense furfuraceo-puberulis et foliis distincte 5-plinervatis.

Frutex ad 1.5 m; ramuli cum inflorescentiis petiolisque dense furfuracei-pubescentes primum fusco-rufi demum fuscescentes. Folia aequalia vel subdisparilia; petioli 2–4 cm longi; lamina chartacea nitidula (10–)15–23 (acumine excluso) × (4.5–)6–9 cm elliptica apice per 1–1.5 cm subabrupte acuminata basi vix cuneata ad margines (praecipue apicem versus) undulato-crenata dentibus cum cilio brevi caduco armatis triplinervata nervis lateralibus subbasilariter insertis sed usque ad 5–10 mm non divergentibus nervis secundariis tertiariisque supra et subtus vix prominentibus tertiariis laxe reticulatis secundariis ca. 1 cm inter se distantibus, subtus per venam medianam modice fur-

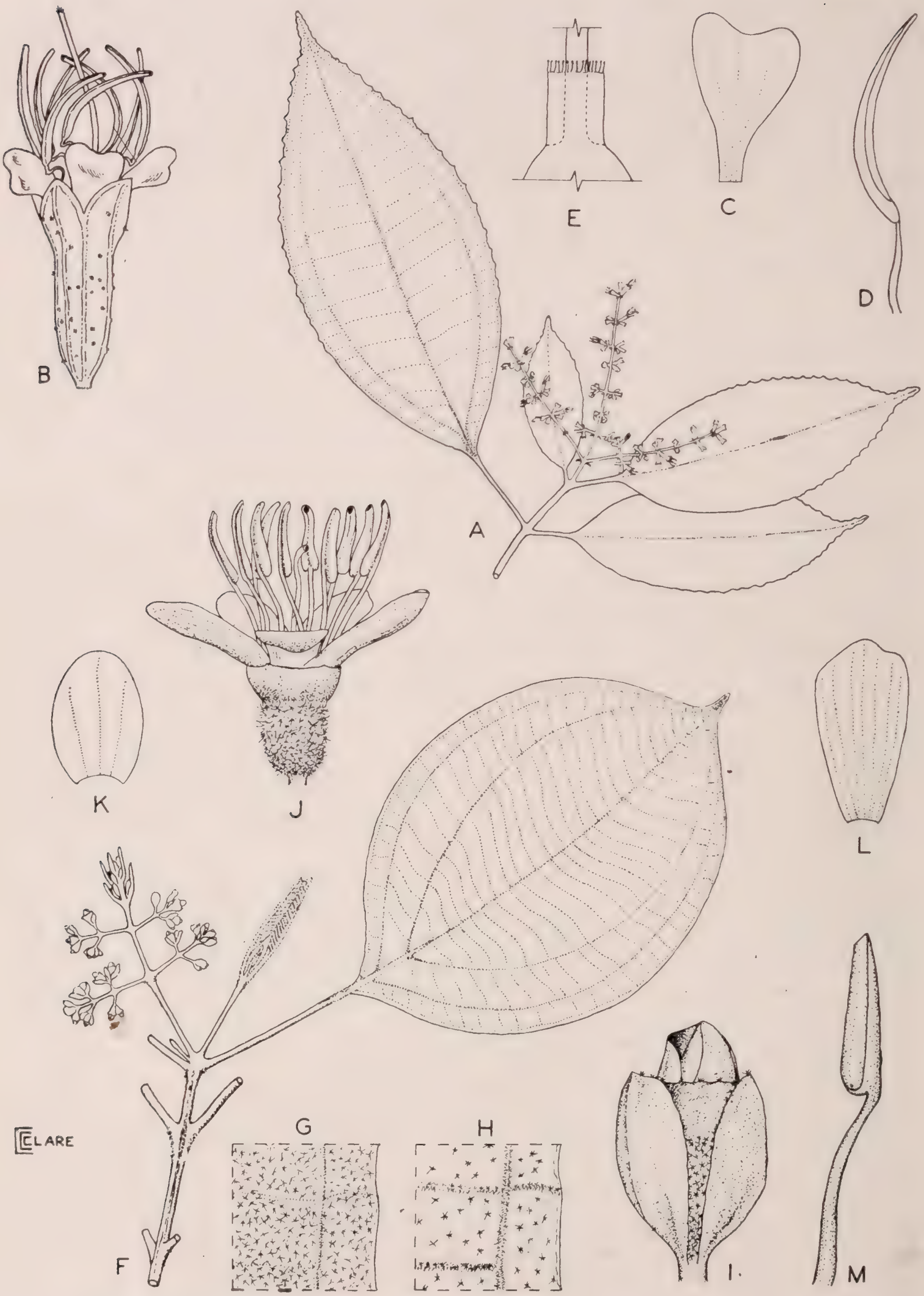


FIG. 32. A–E, *Miconia yatuensis.* A, habit, × 0.3. B, flower, × 7.5. C, petal, × 15. D, stamen, lateral view, × 10. E, ovary apex, × 15. F–M, *Miconia perobscura.* F, habit, × 0.3. G, upper leaf surface, × 5. H, lower leaf surface, × 5. I, bud with bracteoles, × 7.5. J, flower, × 5. K, bracteole, × 7.5. L, petal, × 5. M, lateral view of stamen, × 10.

furacea alioqui glabra. Inflorescentia ca. 7 cm longa plerumque cum ramis duobus 2.5–5 cm longis; ramuli usque ad 5 mm longi confertiflori pauciflori. Flores 4-meri sessiles. Hypanthium (ad torum) 3.4 mm altum anguste oblongum sparse furfuraceo-puberulum 8-sulcatum; calycis lobi interiores membranacei ad 0.2 mm coaliti abrupte acuti, lobis exterioribus quam interioribus vix longioribus 0.6 mm altis triangulari-ovatis apice late acutis. Petala 1.6 × 1–1.1 mm obovata apice oblique retuso-truncata extus vix granulosa. Stamina isomorphica; filamenta 1.3–1.5 mm longa; antherarum thecae 2.6–2.9 mm longae curvatae, connectivo sub thecis 0.3 mm prolongato cum filamento simpliciter articulato non appendiculato. Stylus 5.7 × 0.2 mm; stigma truncatum ca. 0.15 mm diam.; ovarium 3-loculare apice in collum 0.6 mm altum circum stylum prolongatum collo apice brevissime (0.1 mm) glanduloso-ciliato.

VENEZUELA: Amazonas: occasional in flooded forest of uppermost Río Yatua, alt. 140 m; weak shrub, flowers white; 7–8 Dec 1953, *Maguire, Wurdack & Bunting 36695* (holotype, NY); same locality, *Maguire, Wurdack & Bunting 36530* (paratype).

M. lateriflora has glabrous branchlets and basally nerved leaves.

Miconia rupticalyx Wurdack, sp. nov.

M. wagneri Macbr. valde affinis sed cum pubescentia stellata non stipitata bracteolis conspicuis persistentibus connectivi appendice dorsali minore.

Sect. *Laceraria*. Rami teretes vel vix complanato-teretes cum inflorescentiae ramis petiolisque densiuscule stellato-furfuracei. Petioli 4–11 cm longi; lamina membranacea 12–28 × 9–19 cm late ovata apice per 1–2 cm subabrupte angusteque acuminata basi rotundata ad margines undulato-serrulata dentibus ca. 2–3 mm inter se distantibus unisetulosis seta caduca ad 1 mm longa, 5- vel indistincte 7-nervata nervis secundariis 5–9 mm inter se distantibus tertiariis laxe reticulatis omnibus supra subplanis subtus graciliter elevatis, supra glabra, subtus in nervis primariis sparse vel modice stellato-furfuracea alioqui glabra. Inflorescentia paniculata ca. 10–12 cm longa lataque ramis oppositis vel subtus in cuique nodo in paribus duobus distictis; ramuli divaricati. Flores in capitulis paucifloris congesti plerumque 4-meri sessiles; bracteolae ad 1 × 2 mm reniformes amplectae ad margines fimbriatulae et sparse stellato-puberulae. Hypanthium (ad torum) 1.9 mm longum primum sparse stellato-puberulum glabratum; calyx glaber primum in cono membranaceo apiculato ca. 0.7 mm alto clausus demum in lobis irregularibus persistentibus ruptus, dentibus exterioribus obscuris. Petala 2.2–2.3 × 1.3–1.4 mm oblongo-obovata apice rotundata. Stamina fere isomorphica; filamenta 1.6–1.7 mm longa; antherarum thecae 1.9–2 mm longae, connectivo basi vix (0.2 mm) prolongato et postice in calcar 0.1–0.15 mm longo elevato. Stylus 5.6 × 0.3 mm; stigma vix capitulatum vel truncatum 0.4 mm diam.; ovarium (2–) 3-loculare apice in collum 0.6 mm altum circum stylum prolongatum apice lacerato et inconspicue ciliolato ciliis glanduliferis 0.2 mm longis.

VENEZUELA: Amazonas: Cerro de la Neblina, occasional in talus forest between Camps 3 and 4, alt. 1000–1200 m; tree 5–8 m, petals white, anthers yellow; 9 Nov 1957, *Maguire, Wurdack & Maguire 42013* (holotype, NY).

M. wagneri has short-stalked stellate trichomes, inconspicuous setaceous early-caducous bracteoles and a conspicuous blunt dorsal connective appendage 0.2–0.25 mm long. Another close relative, *M. duckei* Cogn., has stalked stellate hairs on inflorescence, stem, and lower leaf surface, and predominantly 5-merous flowers with the young hypanthium setulose and the dorsal stamen connective

calcar 0.3–0.4 mm long. It seems probable that further collections will show *M. dorsiloba* Gleas., of Costa Rica and Colombia, to be conspecific with *M. duckei.* These four species, together with M. *centrodesma* Naud. (and probably *M. diaphanea* Gleason), all have a calyptrate apiculate calyx splitting irregularly at anthesis and persisting. Following Cogniaux' classification, all belong in sect. *Laceraria.*

Miconia centrodesma Naud.

M. buchtienii Cogn. Repert. Sp. Nov. **8:** 2. 1910.
M. subtriloba Gleason, Bull. Torrey Club **58:** 429. 1931.

This widespread species is now known in the Guayana area from several Schultes collections in the Vaupés drainage, from the slopes of Cerro Duida, and from the Neblina slopes (*Maguire, Wurdack & Maguire 42017*). Two isotypes (*Martius Herb. Fl. 498*) have been examined and show predominantly 4-merous flowers, as do other specimens over the species range; the original description of 5-merous flowers was probably based on one of the few anomalous flowers always found in a large collection series.

Miconia fanshawei Wurdack, sp. nov. Fig. 31, K–Q.

M. diaphaneae Gleas. affinis sed cum foliis supra subpersistenter pubescentibus hypanthio densissime longeque hirsuto calycis dentibus exterioribus eminentibus.

Frutex; rami cum petiolis inflorescentiis hypanthiisque densissime hirsuti pilis stipitato-stellatis plerumque 1.5–3 mm longis stramineis. Petioli 1.5–4 cm longi; lamina chartacea 15–25 × 8–15 cm ovato-oblonga vel ovata apice graditer vel subabrupte acuminata basi plerumque cuneata serrulata dentibus 1–2 mm profundis et ca. 2 mm inter se distantibus 5- vel sub-7-plinervata, supra primum modice cum pilis stipitato-stellatis vestita tarde glabrata pilis in venis primariis plusminusve persistentioribus, subtus praecipue in venis venulisque modice cum pilis stipitato-stellatis induta. Inflorescentia 3–13 cm longa plusminusve compacta ramulis brevibus vel brevissimis. Flores 5-meri sessiles in glomerulis lateralibus compactis. Hypanthium (ad torum) 2.5 mm altum; calycis tubus 0.2 mm altus, lobis interioribus anguste triangularibus et stipitato-stellato-setulosis cum corpore 0.4–0.5 mm longo, lobis exterioribus linearibus acutis dense stipitato-stellato-setulosis cum corpore 1.3–1.5 mm longo lobos interiores ca. 1 mm superantibus. Petala 2.7–3.5 × 0.7–1 mm oblonga apice rotundata. Stamina fere isomorphica; filamenta 2 mm longa; antherarum thecae 2 mm longae, connectivo basi non vel vix (ad 0.3 mm) prolongato et cum filamento simpliciter articulato non appendiculato. Stylus 5–6 × 0.25–0.35 mm; stigma leviter expansum; ovarium 3-loculare apice in collum 0.3–0.6 mm longum circum stylum protractum collo apice vix lacerato et leviter setuloso.

BRITISH GUIANA: Mile 114, Bartica-Potaro Road; subshrub of roadside and open places on lateritic ironstone gravel, inflorescence scarlet, flowers yellow; 6 Mar 1949, Brit. Guiana For. Dep. 6019 (*D. B. Fanshawe F2872*) (holotype, NY, isotype, K); Mile 115, Bartica-Potaro Road, FD 3820 (*Fanshawe F1084*) (K); Eagle Mountain, Potaro River, FD 5494 (*Fanshawe F2701*) (K, NY) (paratypes).

M. diaphanea has the upper leaf surface pubescence almost completely limited to the primary veins, the long hypanthial pubescence limited to the apex, and very short exterior calyx teeth which are exceeded by the interior teeth. As compared with the other two collections, the Eagle Mountain paratype of *M. fanshawei* shows extremely compact inflorescences with lateral branches scarcely developed; future collections may well show this population to be infraspecifically separable, but there seem to be no floral differences. The radiate trichome branches of the British Guiana species generally are longer than in *M. diaphanea,* but there is overlapping in this character. I was unable to see, even in young buds of *M. fanshawei,* a calyptriform calyx such as is apparently found in *M. diaphanea;* such an observation could be much more easily made in the field on fresh material since the dense pubescence obscures all such delicate features in dried specimens.

Miconia argyrophylla DC. subsp. **gracilis** Wurdack, subsp. nov.

Rami juniores obtuse quadrangulati, vetustiores subteretes. Inflorescentiae ramuli ex axe primario graciles ad basim ca. 0.4–0.5 mm diam.

BRAZIL: Amapá: Serra do Navio, frequent in lowland forest along trail to Rio Araguary; tree 4 m tall, flowers white; 19 Nov 1954, *R. S. Cowan 38428* (holotype, NY); Serra do Navio, *Cowan 38345, 38380* (paratypes). Pará: Akarai Mts. in Rio Mapuero drainage, *A. C. Smith 2933;* Akarai Mts., Imaibau hills, *Guppy 533* (Brit. Guiana For. Dep. 7548) (paratypes).

SURINAME: Rikenau Hill No. 3, vicinity of Moengo, *Cowan 38973* (paratype).

BRITISH GUIANA: basin of Essequibo River near mouth of Onoro Creek, *A. C. Smith 2678* (paratype).

In typical *M. argyrophylla* (including var. *attenuata* Cogn.), the branches are acutely quadrangular and the inflorescence branches 0.7–1 mm diam. *M. crassinervia* Cogn. was placed by Cogniaux in sect. *Chaenanthera;* the *Flora Brasiliensis* illustration shows anthers longitudinally rimose basally but not apically. I have examined two sheets of the type collection (*Riedel 1396,* K, W) and cannot distinguish them from Guiana specimens ascribed to typical *M. argyrophylla;* the anther clefting seems to be caused by drying and/or pressing, rather than a genetic mechanism, and occurs sporadically in Guiana collections of *M. argyrophylla* sensu Cogniaux. Martius synonymized *M. stenostachya* DC. with *M. argyrophylla* and illustrated flowering material of *M. stenostachya* (Nov. Gen. Sp. Plant. **3**: *fig 284*). Unfortunately the type collection of *M. argyrophylla* is fruiting and I have not as yet been able to compare the holotype with recent flowering material. So many *Miconia* species have the same gross aspect as *M. argyrophylla* that the absolute synonymization of *M. crassinervia* is deferred.

Miconia cowanii Wurdack, sp. nov.

M. lepidotae DC. affinis sed cum foliis proportionaliter angustioribus, pube cinerea, antherarum connectivo subtus prominenter expanso.

Sect. *Miconia* subsect. *Seriatiflorae.* Rami acute tetragoni cum petiolis foliis subtus inflorescentiis hypanthiisque pube albido-cinerea stellato-lepidota dense obsiti. Petioli 1–2.5 cm longi; lamina vix coriacea 11–26 × 3–8.5 cm elliptica apice graditer vel subabrupte acuminata basi acuta 5-nervata vel paulo (ad 3 mm) 5-plinervata nervis exterioribus tenuibus nervis secundariis supra vix impressis subtus anguste elevatis nervis tertiariis subtus laxe reticulatis margine integerrima supra glabra. Inflorescentia paniculata 12–28 cm longa cum ramulis extremis secundifloris; flores 5-meri sessiles. Hypanthium (ad torum) 1.9–2.1 mm altum; calycis tubus 0.5 mm altus lobis 0.4 mm altis late deltoideis dente inconspicuo extus ornatis. Petala 2.6–3.1 × 1.5–1.8 mm apice oblique rotundata glabra eciliata. Stamina paulo dimorphica; filamenta 2.2–2.5 mm longa. Sta-

mina antesepala: thecae 1.8–2 mm longae connectivo sub loculis antice 0.2–0.3 mm prolongato et in appendice cordiformi 0.6–0.9 mm longa lataque terminato. Stamina intersepala: thecae 1.6 mm longae, connectivo antice 0.5 mm prolongato et lateraliter bidentato postice sub insertionem filamenti in appendice 0.4 mm longa acuta prolongato. Stylus 3.5 × 0.2 mm apice clavatus cum stigmate 0.5–0.6 mm diam.; ovarium 3-loculare apice in conum glabrum 0.2 mm altum prolongatum; fructus (vix immaturus?) globosus non striatus ca. 4 mm diam. cum calyce persistente.

BRAZIL: Amapá: Serra do Navio, Rio Amapari, occasional in lowland forest along trail to Serra do Viado via Water Supply Dam; tree 7 m tall, flowers white; 17 Nov 1954, *R. S. Cowan 38399* (holotype, NY); Serra do Navio; tree 6 m on southeast lower slopes of Chumbo Ore Body, *Cowan 38071;* tree 10 m on lower slopes of Observatorio Ore Body, *Cowan 38160* (paratypes).

The leaf blades of *M. lepidota* have a length/width ratio of about 2 rather than 3–4, as well as predominantly fulvous stellate-lepidote pubescence rather than predominantly silvery white scales with only scattered fulvous ones; the stamen connectives of *M. lepidota* are proportionately longer-prolonged basally with much smaller basal expansion. *M. cowanii* has somewhat the aspect of *M. argyrophylla* DC., which however has an indiscrete indumentum and glandular-ciliate petals. *M. punctata* (Desr.) Don has a tawny indument, firmer leaves, and anthers widest apically (rather than oblong with a relatively smaller pore), at least in West Indian material.

Miconia navioensis Wurdack, sp. nov.

M. seriali DC, in aspectu arcte affinis sed pubescentia tenuiori floribus vix minoribus connectivo staminum antesepalorum subtus proportionaliter longe prolongato.

Sect. *Miconia* subsect. *Seriatiflorae*. Rami teretes cum petiolis foliis subtus inflorescentiis hypanthiis calycibusque cum pube amorphica tenuissima adpressa pallide fusca dense obsiti. Petioli 1–1.5 cm longi; lamina tenuiter coriacea 9–17 × 2.5–7 cm elliptica apice subabrupte acuminata (acumine 1–1.5 cm longo) basi late acuta vel anguste obtusa margine integerrima 5-nervata nervis duobus exterioribus inframarginalibus nervis secundariis numerosis ca. 2–4 mm inter se distantibus supra vix impressis subtus graciliter elevatis tertiariis laxe reticulatis, supra glabra, subtus cum nervis primariis secundariisque subglabratis. Inflorescentia paniculata 6–10 cm longa ramis longis arcuatis multifloris cum floribus secundis; flores 5-meri sessiles. Hypanthium (ad torum) 1.1 mm altum; calycis tubus 0.7 mm altus apice subtruncatus lobis rotundatis vix 0.2 mm altis. Petala 2.4 × 1.1 mm obovata apice rotundato-subtruncata glabra eciliata. Stamina distincte dimorphica; filamenta 2.3–2.5 mm longa, antheris per porum lateralem pro stamine magnum dehiscentibus. Stamina antesepala: thecae 1.4 mm. longae connectivo usque ad insertionem filamenti 0.6 mm prolongato et sub insertionem postice in appendicem 0.45–0.6 mm oblongam basi rotundato-truncatam armato. Stamina intersepala: thecae 1.2 mm longae, connectivo usque ad insertionem filamenti 0.3 mm prolongato et lateraliter ad 0.4 mm expanso postice sub insertionem in appendicem anguste triangularem 0.5 mm prolongato. Stylus 4.2 × 0.35 mm apice in stigmate truncato 0.4 mm diam. indistincte expansus; ovarium 3-loculare apice in conum subhemisphaericum 0.5 mm altum glabrum prolongatum. Fructus ignotus.

BRAZIL: Amapá: Serre do Navio, Rio Amapari, occasional in forest on Fritz Akerman

Ore Body, alt. ca. 300 m; tree 12 m, flowers white and odoriferous; vern. name ''Maramara branco''; *R. S. Cowan 38118* (holotype, NY).

M. serialis has a striking habital similarity to *M. navioensis,* but has a thicker indument and slightly larger flowers with much larger stamens and the antesepalar anther connectives prolonged only about 0.2 mm to the filament insertion, as well as a proportionately smaller anther pore. *M. albicans* (Sw.) Tr. differs from *M. navioensis* in the subcordate to cordate leaf bases, larger flowers, shorter antesepalar anther connective prolongation, very short blunt alternisepalar posterior anther connective spur, and the more distinctly expanded stigma. The large anther pore and long connective prolongation of the flowers of *M. navioensis* are suggestive of *Miconia* sect. *Glossocentrum,* but the obvious close affinity with *M. serialis* makes the present placement desirable.

Miconia abysmophila Wurdack, sp. nov.

M. bracteatae (DC.) Tr. affinis sed cum foliis angustioribus basi anguste acutis superficie supra (venis exceptis) glabra.

Sect. *Miconia.* Rami cum petiolis inflorescentiis hypanthioque densissime incurvo-setulosi pilis laevibus 2–3 mm longis. Petioli 1–3 cm longi; lamina coriacea integra 6.5–11(–15) × 2–4 cm apice acuta vel paulo (usque ad 5 mm) acuminata basi anguste acuta debiliter 3-plinervata (nervis duobus debilibus inframarginalibus neglectis) nervis interioribus alternatim usque ad 2 cm supra basim insertis, supra in nervis primariis secundariisque dense vel sparse strigosis pilis 1–2 mm longis alioque glabra, subtus densiuscule strigosa pilis ca. 1–1.5 mm longis. Inflorescentia spicata cum floribus in glomerulos congestis vel ad basim cum ramulis brevibus lateralibus usque ad 5 mm longis capitulifloris; flores 5-meri sessiles basi bracteolati, bracteolis ca. 2 × 2 mm ad margines lacerato-setosis. Hypanthium (ad torum) 2.5 mm altum; calycis tubus ca. 0.5 mm altus lobis ovatis ca. 0.5 mm altis rotundatis dentibus exterioribus hebeti-acutis quam lobis interioribus vix brevioribus non eminentibus. Petala 4–4.4 × 2.2–2.4 mm anguste obovata apice ipso vix retusa et pauciciliolata. Stamina isomorphica; filamenta 4.5–4.8 mm; antherae arcuato-attenuatae 3.5 mm longae basi non appendiculatae cum filamento simpliciter articulatae. Stylus maturus ignotus; stigma truncatum; ovarium 3-loculare apice libero 1 mm alto obtuse conico et sparse glanduloso-puberulo pilis ca. 0.1–0.15 mm longis.

VENEZUELA: Amazonas: Cerro de la Neblina, occasional in rock crevices along Cañon Grande east of Cumbre Camp, alt. 1100 m; shrub 0.7–1.5 m, buds white, fruit purple-blue; 24 Nov 1957, *Maguire, Wurdack & Maguire 42206* (holotype, NY).

The pertinent differential characters of *M. abysmophila* are summarized in the key to *M. bracteata* and relatives.

Miconia bracteata (DC.) Triana

M. demerarensis Gleason, Bull. Torrey Club **75**:551. 1948.

Gleason's distinctions for *M. demerarensis* do not hold for any series of specimens of this complex; even on the holotype, some stamens have short dorsal connective prolongations below the filament attachment. I have been able to examine holotypic material, except for *M. trichodes* DC. of which material has not been available to any monographer since de Candolle, for all the names involved in this small species group. A tentative key to them follows:

1. Stem and inflorescence hairs strictly appressed. *M. mutabilis* (DC.) Tr.
1. Stem and inflorescence hairs with at least the bases patent.

2. Stamen connectives anteriorly appendaged.
    3. Connectives basally glandular-lobed; leaf primary veins above at maturity nearly or quite glabrous. *M. matthaei* Naud.
    3. Connectives basally with a cordiform appendage; leaf primary veins above persistently setulose. *M. tschudyoides* Cogn.
2. Stamen connectives anteriorly not appendaged.
    4. Calyx lobes scarcely evolved, 0.3 mm high with concave sides; leaves distinctly crenulate. *M. lappacea* (DC.) Tr.
    4. Calyx lobes well developed, 0.5–2 mm high with convex sides; leaves entire to indistinctly crenulate.
        5. Leaves ovate-elliptic, broadly acute to obtuse at the base, the length/width ratio 2–2.5, the upper leaf surface evenly pubescent; calyx lobes 0.8–2 mm high. *M. bracteata* (DC.) Tr.
        5. Leaves narrowly elliptic, narrowly acute at the base, the length/width ratio 3–4.5, the upper leaf surface (apart from the primary and secondary veins) glabrous; calyx lobes 0.5 mm high. *M. abysmophila* Wurdack.

Miconia ceramicarpa (DC.) Cogn. var. **navioensis** Wurdack, var. nov.

A var. *candolleana* Cogn. differt foliis paulo minoribus subtus intense purpurascentibus pilis hypanthii brevioribus.

Folia 7–11 × 3.5–5 cm subtus purpurascentia densiuscule pilosula pilis ca. 0.3–0.4 mm longis. Hypanthium dense cum setulis patulis 0.5–0.7 mm longis hirsutum.

BRAZIL: Amapá: Serra do Navio, abundant on southeast lower slopes of Chumbo Ore Body, alt. 150 m; herb rooting along stem, covering forest floor densely, leaves dark green above and purple beneath, petals rose, stamens white, fruit rose; 1 Nov 1954, *R. S. Cowan 38075* (holotype, NY); Serra do Navio, Water Supply Dam along trail to Serra do Viado, *Cowan 38390* (paratype).

In the typical variety of *M. ceramicarpa* and in var. *violacea* (DC.) Cogn., the stem pubescence is appressed and the appressed lower leaf surface pubescence is limited to the veins and venules. In var. *candolleana,* the apparently concolorous mature leaf blades are 12–16 × 5–8 cm and the hypanthial hairs are 1–1.5 mm long; it is represented, apart from the syntypes, by *Cowan 38386* from the lowland forest near Serra do Navio.

Miconia borjensis Wurdack, sp. nov.

M. aulocalyci Mart. ex Tr. et *M. abbreviatae* Mgf. affinis sed cum floribus maioribus plerumque 6-meris.

Sect. *Miconia.* Rami superne leviter compressi vetustiores teretes juniores cum petiolis inflorescentiis hypanthiisque sub lente dense adpresseque stellato-sublepidoto-pubescentes. Petioli 1.5–2 cm longi; lamina 8–15 × 2.5–5 cm anguste ovata vel ovato-elliptica apice sensim acuminata basi late acuta tenuiter coriacea vel membranacea ad margines indistincte serrulata serratulis tenuibus ca. 2 mm inter se distantibus 3-nervata vel indistincte 5-nervata (propterea 5-plinervata nervis interioribus duobus 2–3 mm supra basim insertis) nervis secundariis supra vix impressis vel obsoletis subtus leviter elevatis, tertiariis vix evolutis cum areolis magnis laxis, supra glabra, subtus dense vel densiuscule adpresseque albido-stellato-sublepidoto-pubescens. Paniculae 3-10 cm longae ramis trifloris vel simpliciter furcatis cum ramulis plerumque trifloris; flores plerumque 6-meri rare 5-meri plerumque 1–2 mm pedicellati ad basim hypanthii bibracteolati bracteolis caducis linearibus 5 × 0.9–1.6 mm. Hypanthium (ad torum) ca. 3 mm altum; calycis tubus 1.4–1.5 mm altus apice truncatus extus

inconspicue 6-dentatus dentibus non eminentibus. Petala 6–6.5 × 4–4.5 mm obovata apice oblique truncata extus centraliter granuloso-sublepidoto-pubescentia. Stamina subisomorphica; filamenta ca. 6 mm longa; antherarum thecae 4.5–5 mm longae oblongo-lanceolatae connectivo postice 0.2 mm vel 0.4–0.6 mm in appendice truncato prolongato antice non vel vix bilobulato glabro vel ad basim per margines cum glandulis minutis sessilibus munito. Stylus 10.5–12.5 × 0.6–0.8 mm basim versus sparse stellato-puberulus; stigma truncatum 0.5 mm diam.; ovarium 6-loculare apice in collum 0.7–0.9 mm altum ad verticem stellato-puberulum protractum.

VENEZUELA: Bolívar: frequent at base of Cerro San Borja, Río Orinoco, alt. 100 m; shrub 3 m, petals white, flowers mostly 6-merous; 12 Dec 1955, *Wurdack & Monachino 39827* (holotype, NY); occasional along Río Parguaza between mouth and El Carmen (50 river km upstream), alt. 80–110 m; shrub 1.5 m, flowers white; 3 Jan 1956, *Wurdack & Monachino 41086;* La Paragua, Río Paragua, alt. 70 m, *L. Williams 12591* (NY) (paratypes).

The field notes for the type collection indicate that the leaves are sometimes 3-whorled. Both of the paratypes have leaf blades proportionately wider than in the type collection and, in *41086,* of thinner texture.

Both *M. aulocalyx* and *M. abbreviata* have 5-merous flowers, hypanthium plus calyx 3–3.5 (rather than ca. 4.5) mm long (ex Macbride photographs), and entire leaves. From the foliar variability seen in New York material of *M. aulocalyx* and *M. abbreviata,* the distinctness of these two species seems doubtful although *M. aulocalyx* was described with glabrous petals and *M. abbreviata* with pubescent petals. The flower size in *M. borjensis* suggests somewhat *Miconia* sect. *Tamonea* near *M. trailii* Cogn. I have examined the Kew material of *M. trailii,* which has much larger leaves with prominent tertiary veins and coarser pubescence, smaller bracteoles, and larger flowers with the campanulate-oblong regularly sulcate calyces and long-attenuate anthers characteristic of other members of sect. *Tamonea,* rather than suggesting a close relationship with *M. borjensis.*

Miconia guaiquinimae Wurdack, sp. nov.

M. pilgerianae Ule in inflorescentiae antherarumque forma affinis, sed cum foliis subtus pubescentia densissima sublepidoto-stellata appressaque vestita.

Sect. *Glossocentrum.* Rami juniores obtuse quadrangulati vetustiores teretes cum foliis subtus petiolis inflorescentiis hypanthiisque densissime granuloso-stellato-pubescentes pube primum rava demum fuscescenti. Petioli 1–2 cm; lamina coriacea plerumque 6–15 × 2.5–5 cm elliptica apice graditer vel subabrupte brevi-acuminata basi late acuta vel anguste rotundato-obtusa, supra primum modice stellulato-puberula demum glabrata, trinervata (jugo inframarginali debili neglecto) nervis secundariis supra anguste impressis subtus elevatis utrinque 15–20 et 3–6 mm inter se distantibus tertiariis non evolutis, ad margines integerrima. Inflorescentia paniculata 7–12 cm longa ramis distichis ad nodos plerumque 4; flores 5-meri sessiles, bracteolis ca. 0.5 mm longis oblongo-linearibus valde caducis. Hypanthium (ad torum) 2 mm altum; calycis tubus 0.4 mm altus ad apicem cum lobulis indistinctis 0.2 mm altis. Petala ca. 2.2 × 1 mm obovato-oblonga apice rotundata extus et intus cum marginibus superficieque granuloso-puberulis. Stamina paulo dimorphica apice cum poro lato 0.4 mm diam. dehiscentia, filamentis ca. 2.4 mm longis. Stamina antesepala; thecae 0.9 mm longae, connectivo sub loculis 0.7–0.9 mm prolongato et postice in appendice rotundata 0.3–0.6 mm prolongato. Stamina intersepala: thecae 0.9–1 mm longae, connectivo sub loculis 0.7–0.8 mm prolongato et postice in appendicem triangularem prolongato. Stylus 4.2 × 0.4 mm apice vix (ad 0.5 mm diam.) in stigma truncatum expansus; ovarium 3-loculare apice truncatum et minute granulosum.

M. guaiquinimae Wurdack subsp. **guaiquinimae.**

Lamina usque ad 9 × 4.5 cm late elliptica apice subabrupte breviacuminata basi rotundato-obtusa proportione longitudinis/latitudini ca. 2:1.

VENEZUELA: Bolívar: Cerro Guaiquinima, Río Paragua, infrequent in quebrada below southeast escarpment, alt. 1600–1700 m; tree 4 m high, flowers white and very fragrant; 7 Jan 1952, *Bassett Maguire 33024* (holotype, NY), lower slopes of Ilu-tepuí, occasional in low *Clusia-Magnolia* woodland on ridge east of Mesa Grande, alt. 1650 m; tree 10 m in bud; 9 Mar 1952, *Maguire 33320* (paratype).

M. guaiquinimae Wurdack subsp. **angustifolia** Wurdack, subsp. nov.

Lamina usque ad 15 × 5 cm anguste elliptica apice graditer acuminata basi late acuta proportione longitudinis/latitudini ca. 3–4:1.

VENEZUELA: Bolívar: Cerro Guaiquinima, occasional in mixed montane forest at Intermediate Camp, alt. 1200 m; tree 15 m tall; 14 Jan 1952, *Bassett Maguire 33102* (holotype, NY).

Both *M. pilgeriana* and the closely related *M. stellipilis* Cogn. have much sparser foliar pubescence, with individually much larger stellate hairs, and considerably smaller flowers, with the hypanthium plus calyx only 1–2 mm long. The pubescence of *M. guaiquinimae* is intermediate between these two subandean species and that of the scorpioid-cymed group centering around the poorly distinguishable species *M. punctata* (Desr.) Don and *M. lepidota* DC.; *M. semisterilis* Gleason, with compact-scorpioid inflorescence branches, seems to be a very close relative of these two widespread species, but has stamens similar to *M. guaiquinimae* and its relatives in sect. *Glossocentrum.* The inflorescence pattern is basically quite different in the two species-groups, with the *M. pilgeriana*-group having four branches per main inflorescence axis node while the *M. punctata*-group has two branches per node.

Miconia perobscura Wurdack, sp. nov. Fig. 32, F–M.

De affinitate mihi incognita sed ob stamina de sectione *Amblyarrhenae.*

Ramuli sulcato-quadrangulati primum sparse cum pilis brevistipitatis stellatis muniti et densiuscule cum inflorescentiae ramis petiolis laminisque pilis stellatis sessilibus obsiti. Petioli 4–13 cm longi apicem versus cum pilis brevistipitatis stellatis subpersistentibus densiuscule armati; lamina chartacea vel subcoriacea (9–)15–23 × (5–)10–17 cm late elliptica apice abrupte breviterque (ad 1 cm) acuminata basi late obtusa vel truncata ad margines inconspicue crenulata 7-plinervata nervis primariis interioribus usque ad 7 cm supra basim insertis paribus exterioribus 5–10 et 8–15 mm supra basim insertis nervis secundariis 3–6 mm inter se distantibus et marginem versus paulo arcuatis tertiariis laxe reticulatis, nervis ambiter supra subplanis subtus anguste elevatis, nervis primariis subtus ad laminae basim cum pilis brevi-stipitatis stellatis obsitis, superficie subtus subglabrata. Inflorescentia laxe paniculata usque ad 20 cm longa lataque; bracteae valde caducae vix carinatae in ramis primariis oblongo-lanceolatae et ad 15 × 4 mm, in ramulis oblongo-ovatae et ad 7 × 4 mm sparse (in nervis densiuscule) stellato-puberulae. Flores 5-meri breviter (1–3 mm) pedicellati cum bracteolis duabus conspicuis ca. 2.5–3.5 × 2.3 mm in anthesi caducis ovalibus vel suborbicularibus sparse stellato-puberulis ad basim hypanthii insertis investi. Hypanthium (ad torum) 2 mm altum dense stellato-puberulum; calycis tubus 1–1.2 mm altus subglaber apicem inconspicue 5-dentatus dentibus vix 0.1 mm altis. Petala glabra 5–5.2 × 2.3–2.6 mm oblongo-obovata apice rotundata. Stamina isomorphica; filamenta 2.7 mm longa; antherae 2.3 mm longae oblongae non appendiculatae cum poro unico minuto ventraliter subterminali dehiscentes. Stylus ca. 4.5 × 0.5 mm; stigma truncatum; ovarium 3-loculare apice breviter conicum et sparse stellato-puberulum.

VENEZUELA: Amazonas: Cerro de la Neblina, frequent along upper escarpment slopes east of Camp 3, alt. 1700 m; shrub 2–3 m, flowers pale pink; 27 Dec 1953, *Maguire, Wurdack & Bunting 36833* (holotype, NY).

The involucrate floral bracteoles of *M. perobscura* are suggestive of *Miconia* sect. *Tamonea*, the hypanthium of sect. *Octomeris*, but the 4-celled one-pored narrowly oblong non-subulate anthers are congruent with sect. *Amblyarrhena*. No close relatives are apparent, although the leaf venation and shape (apart from the margins) are similar to those of the Ecuadorian *M. rivetii* Dang. & Cherm.

Tococa pachystachya Wurdack, sp. nov. Fig. 33, C–G.

Ut videtur *T. hirtae* Berg ex Tr. affinis sed cum floribus sessilibus in racemo pachystachyo.

Sect. *Epiphysca*. Frutex 0.5–3 m. Rami cum petiolis laminis inflorescentiisque modice setosi setis glanduliferis plerumque ca. 1.5 mm longis sed in formicariis crassioribus et ad 3 mm. Folia plerumque vesiculifera sed pro parte vesiculis nullis; petioli (formicario excluso) ad 1 cm longi; formicaria in foliis maioribus ca. 2–2.5 cm longa et usque ad 1 cm lata ½–2/3 in lamina immersa; lamina vesiculifera plerumque 12–21 × 6–9 cm (in lamina non-vesiculifera 4–7 × 2–3 cm) elliptica vel vix obovato-elliptica apice per ca. 1–1.5 cm subcaudato-acuminata basi supra formicarium cordulata breviter 7-plinervata (vel in folio minore 7-nervata) nervis omnino supra indistincte impressis subtus vix elevatis nervis secundariis plerumque 3–5 mm inter se distantibus, ad margines indistincte irregulariterque undulata. Inflorescentia tetragona et 4-alata 7–15 cm longa 5–8 mm crassa racemiformis; flores 5-meri sessiles in angulis oppositis rhachis distichi et ut videtur in paribus, ad basim cum bracteolis duabus ca. 2–3 × 1–1.5 mm late ovatis apice obtusis extus apicem versus paucisetosis investi. Hypanthium (ad torum) 3–3.2 mm altum glabrum; calycis tubus 0.9-1 mm altus apice indistincte 5-lobatus lobis rotundatis usque ad 2 mm altis apice 1–2-setosis setis glanduliferis ca. 1.5 mm longis. Petala 6.8–7 × 4.2–4.4 mm oblongo-obovata apice oblique truncata glabra. Stamina isomorphica; filamenta 4 mm longa; antherae 3.3–3.5 mm longae oblongae leviter arcuatae ventraliter uniporosae non appendiculatae. Stylus ca. 6 × 0.6 mm; stigma capitatum 1.6–1.9 mm diam.; ovarium 4-loculare apice glabrum et in collum conicum 1 mm altum circum stylum protractum; bacca nigro-caerulea ca. 7 mm diam., seminibus 1 × 0.6–0.7 mm laevibus angulato-pyramidatis.

VENEZUELA: Amazonas: Cerro de la Neblina, frequent in upper slope forest east of Camp 3, alt. 1600 m; shrub 1–2 m, petals burnt orange, stamens white; 24 Jan 1954, *Maguire, Wurdack & Bunting 37368* (holotype, NY); upper escarpment slopes east of Camp 3, alt. 1700 m, *Maguire, Wurdack & Bunting 36832, 36919;* escarpment overlooking Cañon Grande below Cumbre Camp, alt. 1650 m, *Maguire, Wurdack & Bunting 37211;* scrub forest along caño 2 km north of Cumbre Camp, alt. 1700 m, *Maguire, Wurdack & Bunting 37154;* Cumbre Camp swale, alt. 1800–1900 m, *Maguire, Wurdack & Maguire 42126* (all paratypes).

In Cogniaux' treatment, *T. pachystachya* would key closest to *T. capitata* Trail ex Cogn. and *T. trailii* Cogn., both of which have a very short inflorescence

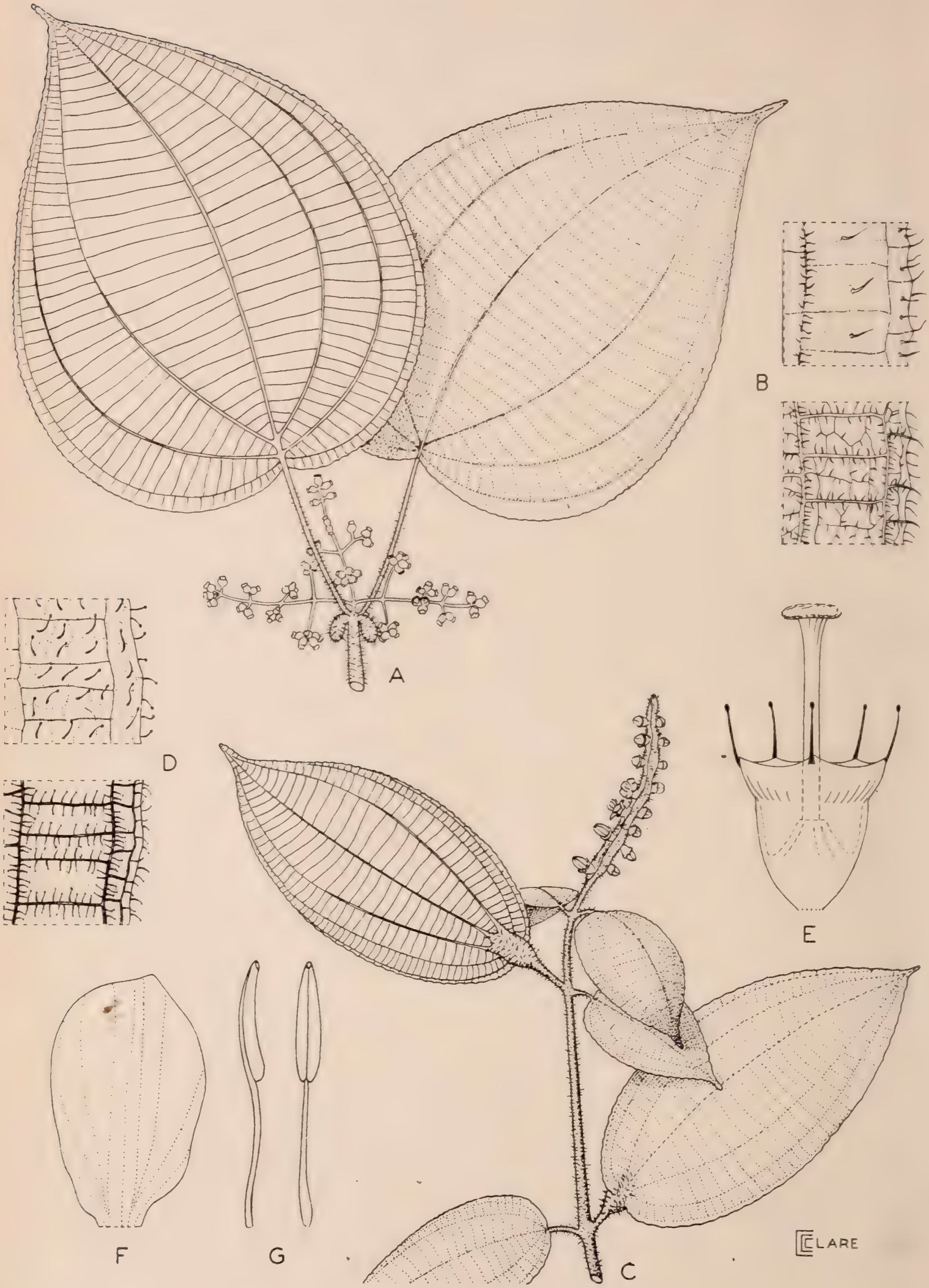


FIG. 33. A, B, *Clidemia neblinae*. A, habit, × 0.25. B, upper and lower leaf surface details, × 2. C–G, *Tococa pachystachya*. C, habit, × 0.25. D, upper and lower leaf surface details, × 2. E, flower with stamens and petals removed, × 5. F, petal, × 5. G, lateral and ventral views of stamen, × 5.

axis and rather different flowers with a setulose ovary apex. In vegetative and flower characters, *T. hirta* seems the closest relative, but differs widely in inflorescence nature, having a loose panicle with a few pedicellate flowers. The thickened inflorescence axis of *T. pachystachya* is not at all teratologic, being constant throughout the abundant Neblina population; such an axis can be seen developed to some extent in such other species as *T. setifera* Pilger and *T. stellata* Gleason, both of which have otherwise nothing suggestive of very close relationship with *T. pachystachya.*

Tococa bolivarensis Gleason subsp. **occidentalis** Wurdack, subsp. nov.

Rami nodis exceptis glabri; folii lamina ad margines primum ciliata sed ciliis valde caducis alioqui glabra; hypanthium glabrum; calycis tubus et lobi sparse glanduloso-setosi.

VENEZUELA: Amazonas: Cerro Yutaje, Río Manapiare, occasional on rocky slopes and cliffs below summit, alt. 2000–2100 m; rounded densely branched shrub 1–3 m high, petals rose-colored, stamens pale yellow; 17–19 Feb 1953, *Bassett Maguire & Celia K. Maguire 35309* (holotype, NY); Cerro Yutaje, alt. 2200 m, *Maguire & Maguire 35319*; Cerro Yaví, alt. 2200 m, *Phelps & Hitchcock 43, 65* (paratypes).

In typical *T. bolivarensis*, known only from Estado Bolívar (Carrao-tepuí, *Steyermark 60856;* Serra do Sol, *Maguire & Maguire 40410*), the branchlet internodes are sparsely glandular-setose and also thinly furfuraceous with clavate sessile glands, the hypanthium as well as the calyx is glandular-setose, and the leaf blades are persistently glandular-ciliate as well as plus-or-minus glandular-setulose marginally above and on the primary veins beneath. The mature calyx of both subspecies is obscurely 5-lobed, rather than strictly truncate as originally described.

Clidemia neblinae Wurdack, sp. nov. Fig. 33, A, B.

C. tococoidiae (DC.) Gleas. et *C. crenulatae* Gleas. in aspectu vegetativo affinis sed inflorescentia bene evoluta et floribus 5-meris.

Rami cum petiolis modice setosi, setis rigidis patentibus 2–3 mm longis et glandula caduca terminatis, et densissime setulosi setulis ca. 0.5 mm longis plusminusve deflexis, ad basim petiolorum vesiculiferi vesiculis reflexis ca. 1 cm longis dense setosis. Petioli (2–)8–13 cm longi; lamina membranacea (13–) 20–35 × (6–)13–27 cm ovata apice subabrupte per 1–2 cm acuminata basi leviter cordata ad margines crenato-denticulata denticulis ca. 3–4 per cm et 0.5–1 mm profundis, 7- vel debiliter 9-nervata nervis secundariis ca. 5–8 mm inter se distantibus tertiariis laxe reticulatis nervis omnibus supra subplanis subtus graciliter paulo elevatis, supra in superficie sparse strigulosa (pilis ca. 1/mm^2) et in venis primariis modice reflexo-setulosa pilis omnibus caduco-glanduliferis et ca. 0.5–1 mm longis, subtus in venis primariis densiuscule setulosa in venulis sparse setulosi pilis non-glandulosis plerumque ca. 0.3–0.7 mm longis. Inflorescentia paniculata densissime reflexo-setulosa (setulis ca. 0.3–0.5 mm longis) ca. 10 cm longa, ramis principalibus lateralibus duobus oppositis ad 7 cm longis subbasilaribus. Fructus 5-meri sessiles teretes ca. 5 mm diam. densiuscule puberuli setulis ca. 0.2–0.3 mm longis ad apicem breviter 5-lobati dentibus interioribus exterioribus aequantibus lobis singulis seto unico 1–1.5 mm longo glandulifero terminatis; ovarium 3-loculare apice glabrum; semina numerosa laevia ovoidea ca. 0.5 × 0.3 mm.

VENEZUELA: Amazonas: Cerro de la Neblina, frequent in high montane forest 6–8 km south of Camp 3, alt. 1400–1600 m; much branched tree 3–6 m, inflorescence branches reddish, fruit green and 5-merous; 24 Dec 1953, *Maguire, Wurdack & Bunting 36862* (holotype, NY); same place, *Maguire, Wurdack & Maguire 42583* (paratype).

The vegetative similarity in cauline formicaria and type of pubescence to the two postulated relatives is remarkable; both these species, however, with their subsessile-leafed relatives centering around *C. elata* Pittier, have 4-merous flowers. The inflorescence of *C. neblinae* appears terminal, but such other species of *Clidemia* as *C. coriacea* Naud. also have terminal or pseudo-terminal inflorescences. The present generic disposition of *C. neblinae* is based primarily on the notable cauline formicarial specialization known to me in the family only in this *Clidemia* species-group.

Mouriri uncitheca Morley & Wurdack, sp. nov.

M. subumbellatae Tr. affinis sed cum foliis cordatis et thecis antherarum minus valde dorsaliter curvatis.

Subg. *Pericrene* sect. *Cyrtotheca*. Frutex glaber 1–3 m altus. Folia sessilia crasse coriacea (3.5–)6–10 × (2–)3-6 cm ovata vel oblongo-ovata apice per ca. 5 mm subabrupte acuminata basi rotundata et leviter (2–3 mm) cordata vena centrali supra insculpta subtus vix elevata nervis lateralibus non vel vix evolutis supra et subtus anguste obscureque insculptis. Inflorescentiae in foliorum superiorum axillis 1–3-aggregatae singulae 1-3-florae; pedunculi 3–15 mm longi; pedicelli 3–12 mm longi circa medium bibracteolati; bracteae bracteolaeque 3–6 × 1.2–2 mm lanceolatae ascendentes post anthesim plus minusve persistentes. Flores 5-meri. Hypanthium (usque ad torum) 3.2–3.5 mm altum; calycis tubus 0.7–1 mm altus, lobis 1.3–1.5 × 3–3.2 mm depresso-triangularibus ad margines vix fimbriato-ciliolatis singulis extus minute unidentatis mucrone ca. 0.2–0.3 mm eminenti. Petala 9.5–9.8 × 6–6.5 mm oblongo-ovata apice attenuato-acuta undique dense granulosa. Filamenta 7.5–8 mm longa; antherarum thecae 2.3–2.7 mm longae uncinatae dorsaliter vix prolongatae, glandula dorsali 1.5–1.7 mm longa, connectivo sub thecas usque ad filamenti insertionem ca. 0.3 mm prolongato postice in calcar 1.1–1.4 mm longum hebeti-acutum protracto. Stylus 13–14 × 0.6–0.75 mm; stigma punctiforme 0.3 mm diam.; ovarium 5-loculare in cuique loculo 4-ovulatum placenta basilari. Fructus i.s. depresso-globosus ca. 10 mm diam. 3–5-spermus; semina ca. 6 × 4 mm asymmetrice ellipsoidea nitida laevia.

VENEZUELA: Amazonas: infrequent at edge of Sabana El Venado on left bank of Caño Pimichín above Pimichín, alt. 140 m; shrub 1.5–3 m, petals white, filaments pink, anthers purple; 14 Apr 1953, *Maguire & Wurdack 35570* (holotype, NY; isotype, MIN); same place, *35576;* fruit pale orange, *Maguire, Wurdack & Keith 41814* (paratypes).

Anatomical features: margins of midrib xylem turned up, in, and slightly down at the very edges, not touching each other nor the upper surface of the xylem; foliar stone cells above and below the midrib xylem extending less than one-fourth the distance from the node to the midrib tip; foliar terminal sclereids filiform, running vertically between the epiderms and there turning and spreading out horizontally as well as usually branching; stomatal crypts simple, 75–110 per square mm, the cavity averaging ca. 31 μ in diameter and 120 μ deep, the mouth ca. 5 μ in diameter; upper epidermis double, the outer layer with more cells than the inner, the lower epidermis single, the inner walls of the lower epidermal cells and of the cells of the inner layer of the upper epidermis from frequently to not at all mucilage-thickened; hypodermis absent except near the midrib; floral terminal sclereids short-filiform, occasional in calyx lobes, rare in petals, otherwise absent; floral stone cells absent.

Within the sect. *Cyrtotheca, M. uncitheca* shows the following unusual features:

1. The moderately inrolled midrib xylem, in which the margins are rolled up and in but scarcely turn down at all, as compared to the other species in which the margins turn down so as almost to touch the upper surface of the xylem.

2. The thick, ovate-cordate leaves, as contrasted with the slightly thinner elliptic leaf blades with abruptly acuminate bases of the near relatives.

3. The large bracts, which exceed in size those of other members of the section with the possible exception of *M. subumbellata,* whose bracts are unknown.

4. The relatively long anther gland and very short dorsal prolongation of the anther sacs, with the near relatives having more nearly equal distribution of the thecae on both sides of the connective.

M. uncitheca is clearly the least specialized member of the section, judging by the two characters that almost certainly have phylogenetic significance: the form of the midrib xylem and the form of the anther. The former feature, as described above, appears definitely to be less complex in our new species than in the other members of the section. The anther form is evolution-wise particularly illuminating; it illustrates the first step in the phylogenetic movement of the pollen sacs from the usual ventral position to the gland side of the connective. In *M. subumbellata* and in some specimens of *M. densifoliata* Ducke the pollen sacs lie about one-third on the gland side of the anther and two-thirds on the opposite side; in other specimens of *M. densifoliata,* in *M. dumetosa* Cogn., and in *M. crassifolia* Sagot, the pollen sacs are about equally distributed on both sides; and in *M. anomala* Pulle, more than one-half of the thecae is on the gland side. Thus *M. uncitheca* seems most closely related to *M. subumbellata* on the basis of anther morphology. Other characters, however, are inconclusive, and, in view of the differences listed above, the new species cannot be said to have a truly close relationship to any of the other section members.

ACANTHACEAE[4]

Chaetochlamys wurdackii Leonard, sp. nov. Fig. 34.

Herba usque ad 50 cm altam, caulibus basi 4.4 mm crassa, subquadrangularibus, bifariam hirtellis vel basi glabris, pilis recurvatis usque ad 0.3 mm longis, cystolithis pluribus, 0.064–0.112 mm longis, parallelis; lamina foliorum inferiorum oblongo-ovata, usque ad 10 cm longam et 3 cm latam, acuta vel subacuminata, basi acuta, petiolata (petioli graciles, 1–2.5 cm longi, puberuli, pilis curvatis, circa 0.1 mm longis), supra (sicca) prasina, parce pilosa et ciliata, pilis patentibus, usque ad 1.5 mm longos, subtus olivacea, glabra vel costa parce et minute puberula, costa et venis lateralibus (6–8 paribus) subtus aliquanto prominentibus, supra obscuris, cystolithis aliquanto obscuris, usque ad 0.32 mm longos, gracilibus; folia 4 apicalia inflorescentiam subtendentia ovata, usque ad 11 cm longa et 5 cm lata, breviter acuminata (apice ipso acuto), basi rotundata, sub-

---

[4] By Emery C. Leonard. Published by permission of the Secretary of the Smithsonian Institution.

sessilia; capitula terminalia congesta, 2 paribus foliorum (internodiis 4 vel 5 mm longis) suffulta; bracteae capitula subtendentes ovatae, acuminatae, apice minusve curvatae, usque ad 3.5 cm longae, 1.8 mm latae; bracteae flores subtendentes subulatae, usque ad 17 mm longae, 0.75 mm latae, ciliatae, intus glabrae, extus pilosae, pilis albis, usque ad 1.5 mm longis, patulis vel ascendentibus, costa prominenti; bracteolae 14 mm longae, ceteroqui bracteis similes; calycis segmenta anguste lanceolata, 8–9 mm longa, 1 mm lata, ciliata, apice graciliter acuminata, intus glabra, extus pilosa, pilis albis, patulis vel ascendentibus, usque ad 2 mm longos; corolla matura deest; lobi (immaturi) antherarum superpositi, recti, paralleli, oblongi, apice utrinque rotundati; capsulae clavatae, 11 mm longae, 5 mm latae, 4 mm crassae, obtusae puberulae, apice pilis erectis vel patulis, basi retrorsis, stipitibus sterilibus capsularum candidis, planis, basi 2 mm latis, apice 5 mm latis; semina 2 vel 4, sphaerica, fuliginea, 2–2.5 mm diam.

VENEZUELA: Bolívar: occasional on Cerro Negro Peron and E–W crystalline range on right bank of river just below El Carmen (about 50 km from river mouth), Río Paraguaza, alt. 120–350 m; fruit green; 27 Dec 1955, *J. J. Wurdack & J. V. Monachino 40985* (type, US).

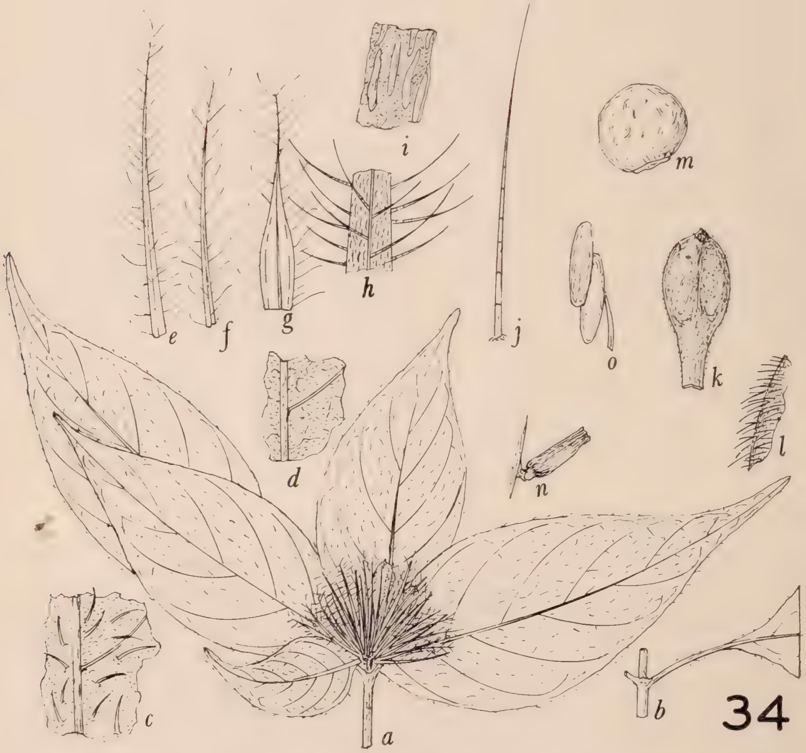
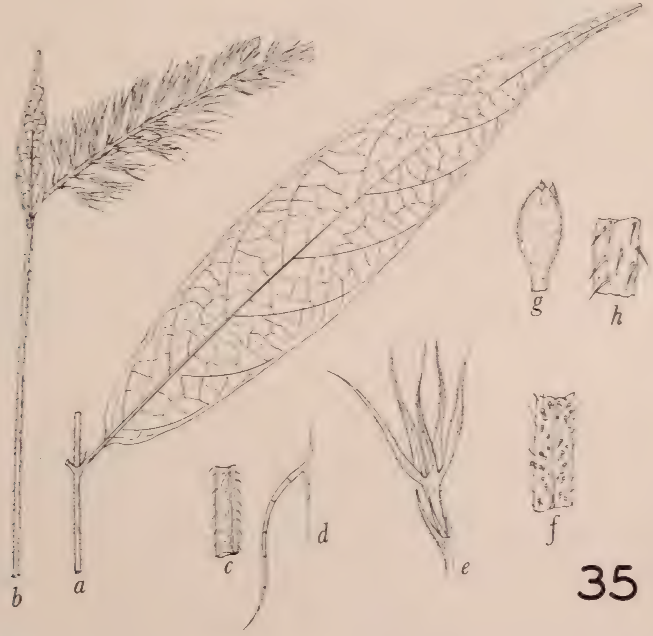


FIG. 34. *Chaetochlamys wurdackii* Leonard (*Wurdack & Monachino 40985*). a, tip of plant, × 0.5; b, petiole of one of the lower leaves, × 0.5; c, portion of leaf blade (upper surface enlarged to show hairs and cystoliths), × 5; d, same of lower surface to show cystoliths, × 5; e, bract, × 3; f, one of a pair of bractlets, × 3; g, calyx segment, × 3; h, portion of segment enlarged to show hairs and cystoliths, × 7.5; i, portion of the calyx segment yet more enlarged to show cystoliths, × 50; j, hair from a calyx segment, × 30; k, capsule valve, × 2; l, portion of capsule enlarged to show pubescence, × 44; m, seed, × 5; n, retinaculum, × 2.5; o, anther (immature), × 7.5.

A single very immature flower bud was found to have escaped the ravages of insects. From this an imperfect concept of the anthers was obtained but no sign of caudae could be found, a character usually well marked in the genus. Perhaps they would be present in mature flowers.

Justicia cataractae Leonard, sp. nov. Fig. 35.

Herba usque ad 40 cm altam, caulibus ascendentibus, basi in nodis radicantibus, subquadrangularibus (angulis rotundatis), bifariam puberulis, pilis retrorse recurvatis, albidis, usque ad 0.25 mm longos; lamina foliorum lanceolata, usque ad 12 cm longam et 2 cm latam, graciliter acuminata, basi angustata (basi ipso rotundato), firma, glabra vel in costa parce et inconspicue pubescens, pilis ascendentibus, usque ad 0.3 mm longos, integra vel undulata, marginibus recurvatis, costa et venis (8 paribus) et venulis aliquanto crasse reticulatis prominentibus, supra cystolithis parcis 0.16 mm longis; petioli 2–3 mm longi, marginibus canalis puberulis; spicae terminales, oblongae, densae, usque ad 4.5 cm longas et 1 cm latas, rhachi puberula, pilis curvatis, 0.13 mm longis; bracteae et bracteolae subulatae, 1.5 mm longae, 0.25 mm latae, carinatae, parce puberulae; calycis segmenta 5, lanceolata, 5.5 mm longa, 0.5 mm lata, acuminata, basi angustata, parce et minute puberula, pilis acutis et pilis glandulosis brevioribus intermixtis, costa prominenti; corolla (immatura) pallide purpurea, parva, 10 mm longa, hirtella, pilis albis, 0.1 mm longis, rectis, patulis; stamina vix exserta, lobis antherarum superpositis, 1 mm longis; capsulae clavatae, 5 mm longae, 1.5 mm latae, 2 mm crassae, puberulae; semina ignota.



35

FIG. 35. *Justicia cataractae* Leonard (*Maguire & Politi 27325*). a, node and leaf, × 1; b, inflorescence, × 1; c, portion of stem enlarged to show pubescence, × 3; d, one of the stem hairs much enlarged, × ca. 100; e, calyx, bract, and one of a pair of bractlets, × 3.5; f, portion (mid) of calyx segment enlarged to show pubescence, × 6.5; g, capsule, × 3.5; h, portion (sub-basal) of capsule enlarged to show pubescence, × 44.

VENEZUELA: Amazonas: frequent, moist woodland trail, Danta (Tapir) Fall, Río Cuao, Río Orinoco; perennial; flowers pale purple; 19 Nov 1948, *Bassett Maguire & Louis Politi 37325* (type, US); same place and date, *Bassett Maguire & Louis Politi 37332a* (para type, US).

The corollas were too immature to permit measurement.

Justicia hylaea Leonard, sp. nov. Fig. 36.

Herba usque ad 1.5 m altam, caulibus subquadrangularibus, leviter 4-sulcatis, nitidis, bifariam hirtellis, pilis retrorse curvatis. 0.5 mm longis, cystolithis parallelis, usque ad 0.32 mm longos; lamina foliorum oblonga, usque ad 16 cm longam et 4.5 cm latam, breviter acuminata, basi angustata, firma, scabrida, integra, parce hirtella, pilis curvatis, 0.25 mm longis, costa et venis lateralibus (10–12 paribus) subtus prominentibus, supra aliquanto obscuris, cystolithis pluribus et conspicuis, usque ad 0.3 mm longos; petioli circa 5 mm longi, parce hirtelli; paniculae terminales, usque ad 7 cm longas et 2 cm latas, densae, floribus sursum contiguis; pedunculi usque ad 5.5 cm longos, subquadrangulares, aliquanto hirsuti, pilis retrorse curvatis, circa 0.4 mm longis, rhachi et rhachillis dense hirsutis, pilis retrorse curvatis, circa 0.4 mm longis; bracteae subulatae, usque ad 11 mm longas et 1 mm latas, carinatae, parce puberulae et ciliatae; bracteolae similes sed minores; calycis segmenta 5, lanceolata, graciliter acuminata, 1 cm longa et 1 mm lata, parce et minute puberula et ciliata, trinervata; corolla pallida caesia, 15 mm longa, glabra vel apice parce pubescens, pilis patulis, 0.2

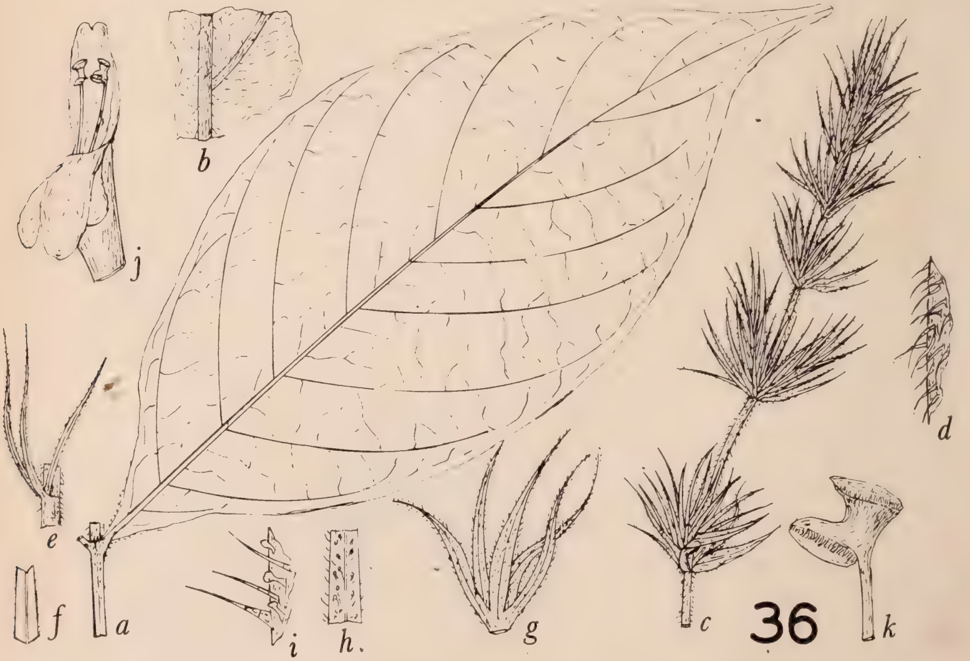


FIG. 36. *Justicia hylaea* Leonard (*Maguire, Wurdack & Bunting 36152*). a, node and leaf, × 1; b, portion of leaf blade (upper surface) enlarged to show cystoliths and hairs, × 2; c, inflorescence, × 1; d, portion of rachis enlarged to show pubescence, × 9; e, bract and bractlets, × 2; f, portion of bract enlarged to show pubescence, × 7; g, calyx, × 2.5; h, portion of calyx enlarged to show pubescence, × 3.5; i, same, more enlarged, × ca. 60; k, anther, × 8.

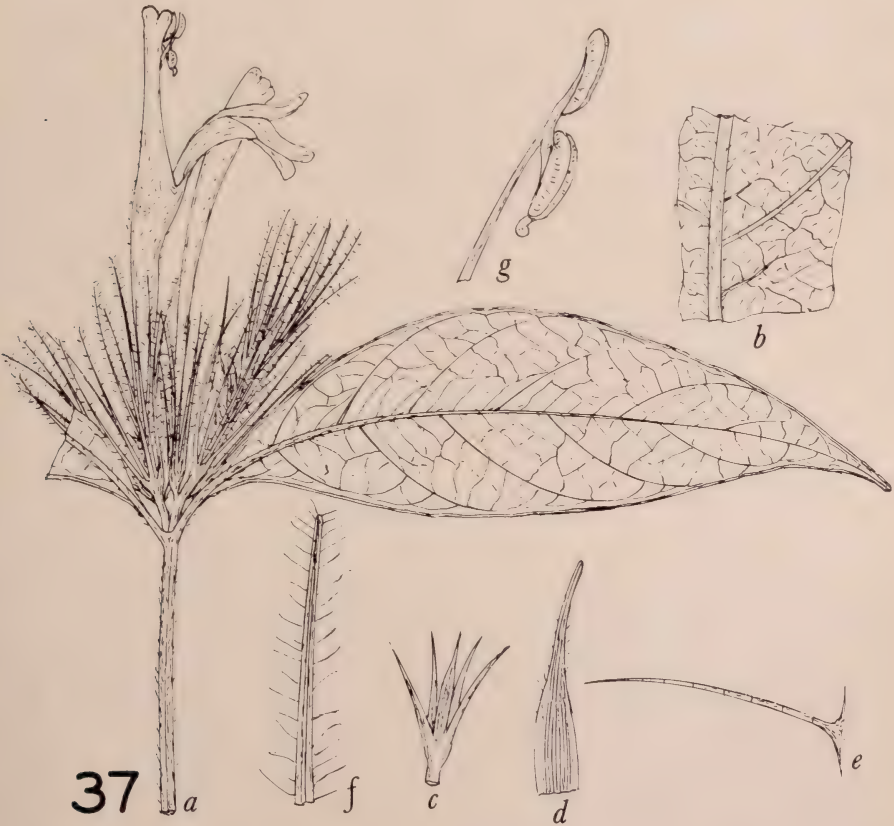
mm longis, tubo 5 mm longo et 4 mm lato, labio superiore erecto, triangulari, basi 4.5 mm lato, apice bilobato, lobis rotundatis, 1 mm longis, 0.75 mm latis labio inferiore erecto vel leviter patulo, 1 cm longo, trilobato, lobis 2 mm longis 2–2.5 mm latis, rotundatis; stamina exserta sed labio superiore breviora, lobis antherarum superpositis et parallelis, margine ciliatis, pilis planis, connectivo plano, 1 mm longo; capsulae (immaturae) pilosae, pilis patulis, deorsum retrorsis.

VENEZUELA: Amazonas: occasional in forest between Sanariapo Road and Salto Carestia (5 km north of Sanariapo), alt. 100–120 m; herb 0.7–1.5 m; flowers pale lavender; 11 Nov 1953, *Bassett Maguire, John J. Wurdack & George S. Bunting 36152* (type, US).

The specific epithet is from the Greek ὑλαῖος, meaning belonging to the woods.

Justicia kunhardtii Leonard, sp. nov. Fig. 37.

Herba usque ad 60 cm altam, caulibus ascendentibus, basi in nodis radicantibus sulcatis, subquadrangularibus, angulis rotundatis, glabris vel sursum hirsutis, pilis ascendentibus, brunneis, usque ad 0.5 mm longos; lamina foliorum lanceolata



37

FIG. 37. *Justicia kunhardtii* Leonard (*Kundardt 9*). a, tip of plant, × 1; b, portion of leaf blade (under surface) enlarged to show venation and hairs, × 2; c, calyx, × 3; d, calyx segment, × 6; e, hair from margin of bract, × 3; f, tip of bract, × 4.5; g, anther, × 6.

vel oblongo-lanceolata, 3–10 cm longa, 0.8–3.5 cm lata, acuminata, apice saepe curvata, basi angustata, firma, integra, nitida, margine recurvata, utrinque aliquanto parce hirsuta, pilis appressis vel ascendentibus, brunneis, usque ad 0.5 mm longos, costa et venis lateralibus (6–8 paribus) subtus prominentibus, venulis crasse reticulatis, supra obscuris, cystolithis mullis; petioli usque ad 1.5 cm longos, dense hirsuti, pilis brunneis, ascendentibus usque ad 0.5 mm longos; spicae breves, densae, usque ad 2 cm longos, terminales, pedunculi 2–3 mm longi, pilosi; bracteae et bracteolae, 10–12 mm longae, 0.5 mm latae, acuminatae, firmae, hirsutae, pilis patulis vel ascendentibus, usque ad 1 mm longos, brunneis, costa prominenti, calycis segmenta 5, anguste acuminata, 5 mm longa, 0.75 mm lata, acuminata, glabra, marginibus albidis subhyalinis, costa promimenti; corolla purpurea (?) parce pubercula, 4 cm longa, basi tubo 1.5 mm lato, prope os 4 mm lato, labio superiore 15 mm longo, erecto, triangulari-ovato, basi 6 mm lato, apice bilobato, lobis rotundatis, 0.5 mm longis et latis, marginibus tuberculatis, labio inferiore 15 mm longo, basi 3 mm lato, trilobato, lobo medio oblongo 8 mm longo, 2 mm lato, rotundato, stamina labio superiore corollae aequalia antice declinata, lobis antherarum superpositis, rectis, connectivo 0.5 mm longo gracili; ovarium glabrum; capsulae ignotae.

VENEZUELA: Bolívar: Angel Falls, Auyan-tepuí; 5 Apr 1950, *H. B. Kunhardt 6* (type, NY); same place and date, *H. R. Kunhardt 9* (paratype, NY).

Justicia plectica Leonard, sp. nov. Fig. 38.

Suffrutex, caulibus usque ad 2 m longos, implicatis, subteretibus, leviter sulcatis, parce puberulis (apice dense et bifariam puberulis), pilis retrorse curvatis 0.16 mm longis; lamina foliorum lanceolata, vel ovato-lanceolata, usque ad 15 cm longam et 3.5 cm latam, acuminata, basi obtusa vel rotundata, aliquanto firma, parce puberula, pilis antrorse curvatis, 0.16 mm longis, praecipue in costa et venis (6–8 paribus) positis, subtus costa et venis prominentibus, supra obscura, cystolithis pluribus; petioli 5 mm longi, puberuli, pilis antrorse appressis, 0.25 mm longis, subtus aliquando pilis rectis, patulis glandulosis praeditis; thyrsi terminales, triangulares, sessiles, usque ad 7 cm longos, basi 3 cm lati, apice acuti, rhachi puberula, pilis curvatis; bracteae et bracteolae anguste lanceolatae, crassae, usque ad 2 cm longas, 0.75–1.5 mm. latae, acutae, aliquanto parce hirtellae, pilis ascendentibus plerumque 0.5 mm longis, apice quandoque pilis rectis patulis glandulosis praeditae, costa obscura; calycis segmenta 5, lanceolata, 12.5 mm longa, 1.75 mm lata, acuminata, parce puberula, pilis plerumque appressis, 0.8–0.16 longis, costa aliquanto prominenti, marginibus albis; corolla aurantiaca, glabra vel in venis parce et minute hirtella, 4–4.6 cm longa, tubo basi 2.5 mm lato, prope os 5 mm lato, labio superiore erecto, anguste ovato, 26 mm longo, basi 8 mm lato, apice 1 mm lato, rotundato, minute bilobato, lobis rotundatis, labio inferiore patulo, 3 cm longo, basi 5 mm lato, trilobato, lobis aequalibus, oblongo-lanceolatis, 2 cm longis, 5 mm latis, apice obtusis; stamina 2 cm supra os corollae exserta, lobis antherarum leviter superpositis, lobo infimo basi calcarato, cauda 0.75 mm longa, alba; capsulae clavatae, 12 mm longae, 6 mm latae, 4 mm crassae, obtusae, minute et dense puberulae; semina 4, sphaerica, minute puberula, albida; retinacula spathulata, albida, 2.5 mm longa, apice plana, rotundata, 1 mm lata.

VENEZUELA: Amazonas: locally frequent on Isla Carestia at Saltos Carestia 7 Gallo (5 km north of Sanariapo), alt. 100–120 m; woody, forming great tangles in low trees to 2 m; flowers orange; 11 Nov 1953, *Bassett Maguire, John J. Wurdack & George S. Bunting 36165* (type, NY; isotype, NY).

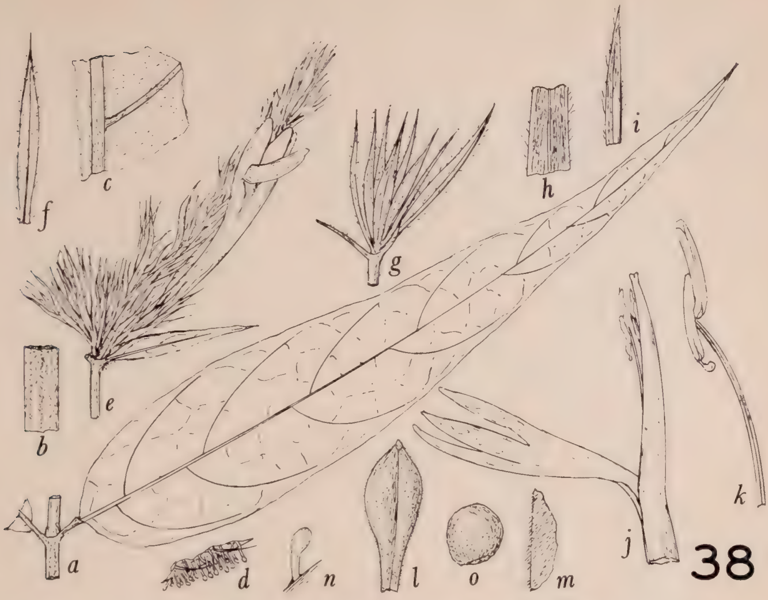


FIG. *38. Justicia plectica* Leonard (*Maguire, Wurdack & Bunting 36165*). a, node and leaf, × 0.5; b, section of stem enlarged to show cystoliths and hairs, × 2.5; c, portion of leaf blade (lower surface) enlarged to show cystoliths and hairs, × 3.5; d, gland-tipped hairs of ventral surface of petiole, × 38; e, inflorescence, × 0.5; f, bract, × 1.5; g, bract, bractlets, and calyx, × 1.5; h, portion of calyx segment, × 6; i, tip of same, × 6; j, tip of corolla, × 1.5; k, tip of stamen to show anther, × 2.5; l, capsule valve, × 1.5; m, portion of valve enlarged to show pubescence, × 2; n, retinaculum, × 2.5; o, seed, × 5.

Justicia plectica is related to *Justicia albomarginata* (Lindau) Leonard (*Beloperone albomarginata* Lindau, Bull. Herb. Boiss. ser. 2. **5**:373. 1905. *Hassler 2755*, Paraguay). The white-margined calyx segments, the capsules and globular seeds of the two species seem to be very similar. The corollas of *J. albomarginata* are however purple instead of orange and much smaller, 32 mm long, the upper lip 14 mm long and the lower 17 mm long. The specific epithet is derived from the Greek word πλεκτικός, meaning tangled and alluding to the tangles formed by the species.

Justicia wurdackii Leonard, sp. nov. Fig. 39.

Herba 1–2 m alta, ramosa, caulibus subquadrangularibus, glabris, cystolithis minutis, subpunctiformibus; lamina foliorum magna, usque ad 30 cm longam et 12 cm latam, breviter acuminata, basi obtusa vel rotundata, in petiolum decurrens, aliquanto firma, integra, glabra vel parce et minute ciliata, costa et venis lateralibus (12–14 paribus) subtus prominentibus, supra obscuris, cystolithis minutis, inconspicuis, e 0.1 ad 0.16 mm. longos; petioli usque ad 9 cm longos, glabri vel marginibus alarum parce et minute hirtelli; paniculae terminales, aliquanto laxae, usque ad 18 cm longas, basi 3–4 cm latae, apice acutae vel subobtusae, floribus secundis, pedunculo 8 cm longo, glabro, internodiis panicularum puberulis, pilis 0.1–0.3 mm, longis; bracteae subulatae, illae ramos infimos panicularum subtendentes usque ad 2.5 cm longas et 1.5 mm latas, aliae minores;

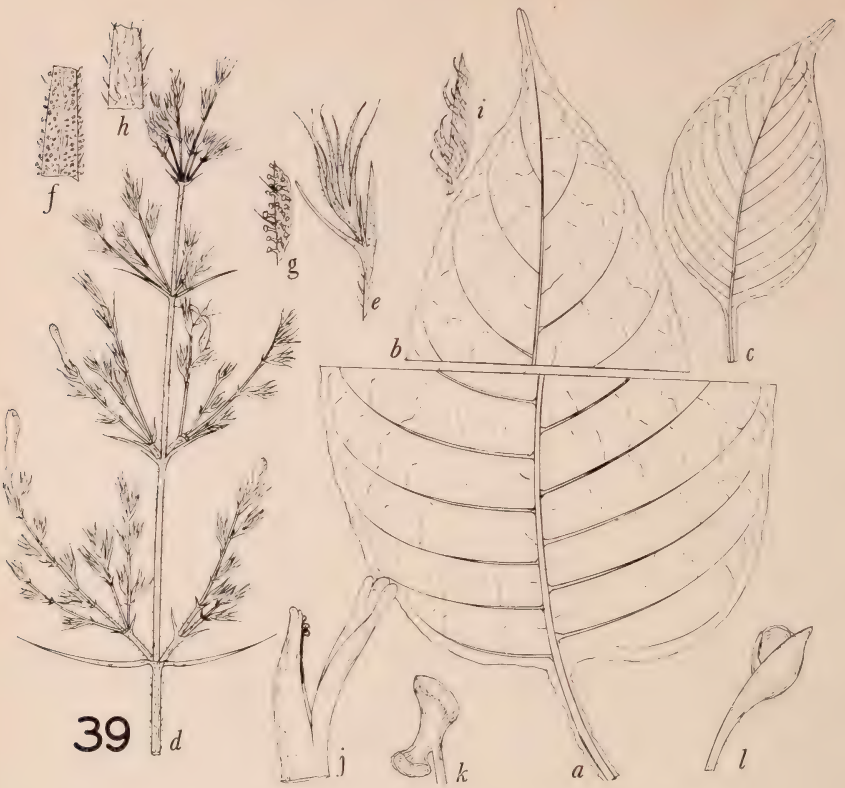


FIG. 39. *Justicia wurdackii* Leonard (*Maguire, Wurdack & Bunting 36811*). a, basal portion of leaf, × 0.5; b, tip of same, × 0.5; c, leaf much reduced to show shape, × 0.15; d, inflorescence, × 0.5; e, bract, bractlet, and calyx, × 3.3; f, portion of calyx segment (outer surface) enlarged to show pubescence, × 5; g, small portion of same more enlarged to show glandular hairs, × ca. 60; h, same portion (inner surface), × 3.3; i, portion of rachis enlarged to show pubescence, × ca. 20; j, tip of corolla, × 1; k, anther, × 6.5; l, valve of capsule, × 2.

bracteolae triangulares, 1–2 mm longae et 1 mm latae; calycis segmenta lanceolata, 7 mm longa, 0.75–1 mm lata, graciliter acuminata, intus minute hirtella, extus etiam papillosa et parce hirtella; corolla purpureo-punicea, glabra vel parce et subtiliter pubescens, 3.5 cm longa, tubo basi 3 mm lato, ad os 7 mm lato, labio superiore erecto, ovato, 15 mm longo, basi 8 mm lato, apice bilobato, lobis rotundatis, 0.5 mm longis et 0.75 mm latis, labio inferiore aliquanto patulo, oblongo, circa 20 mm longo et 8 mm lato, trilobato, lobis rotundatis, 4 mm longis et latis; stamina exserta, labio superiore corollae aequalia declinata, lobis antherarum obliquis, superpositis, connectivo 1 mm longo et 0.5 mm lato, filamentis planis glabris; capsulae clavatae 7 mm longae, 4 mm latae, 3.5 mm crassae, apice obtusae, minute puberulae; semina orbiculata, plana, 3 mm lata et longa, glabra; retinacula 2.5 mm longa, curvata, apice laciniata.

VENEZUELA: Amazonas: Cerro de la Neblina, Río Yatua, occasional in *Clusia* moss-forest just south of Camp 3, alt. 650–700 m; herb 1–2 m, flowers rich purple-pink; 23 Dec 1953, *Bassett Maguire, John J. Wurdack & George S. Bunting 36811* (type, US; isotype, NY); frequent in *Clusia* scrub forest just south of Camp 3, alt. 700 m; herb to 1.5 m; 14–16 Nov 1957, *Maguire, Wurdack & Maguire 42058* (paratype).

Odontonema venezuelense Leonard, sp. nov. Fig. 40.

Frutex vel herba suffrutescens usque ad 2.5 m altam, caulibus subquadrangularibus, glabris vel sursum parce antrorse hirsutis, pilis 0.5–1 mm longis; lamina foliorum oblongo-ovata, usque ad 33 cm longam, et 11 cm latam, breviter acuminata (apice ipso subacuto vel obtuso), basi angusta, integra vel leviter crenulata, firma, supra glabra, cystolithis minutis, usque ad 0.16 mm longos, subtus glabra, costa et venis parce hirtellis pilis usque ad 0.8 mm longos patulis vel ascendentibus exceptis, subtus costa et venis lateralibus (8–10 paribus) et venulis crasse reticulatis prominentibus, supra obscure venosa, cystolithis nullis; petioli crassi, usque ad 2 cm longos, parce hirtelli; panicula terminalis, densa, angusta, usque ad 14 cm longam et 3 cm latam, pedunculis 2 ad 2.5 cm longos et rhachibus plus minusve hirtellis; bracteae subulatae, carinatae, 1 cm longae vel minores, hirtellae; pedicelli 1 ad 2 mm longos, crassi, minute puberuli; calycis segmenta triangularia, 2 mm longa, 1.5 mm lata, acuta, minute puberula; corolla rubra, e 2.5 ad 3 cm longam, parce et minute puberula, tubo basi 2.5 mm lato, supra basim 1.5 mm lato, ad os 4 mm lato, labiis subaequalibus, 8–12 mm longis, labio superiore bilobato, lobis ovatis, 4–5 mm longis, 3–4.5 mm latis, apice rotundatis, labio inferiore ad basim trilobato, lobis oblongis, 2–4 mm latis apice obtusis; stamina vix exserta filamentis complanatis, glabris antheris oblongis, usque ad 5 mm longas et 1 mm latas, lateribus adaxialibus puberulis; staminodia usque ad 5 mm longa, apice antheris inchoatis; capsulae clavatae, glabra, 2.5 cm longae, 6 mm latae, stipitatae; semina plana, 5 mm longa, 4 mm lata basi obliqua, alveolata, cana.

VENEZUELA: Bolívar: Río Parguaza, locally frequent along river at Raudal Maraca (about 110 river km from mouth), alt. 115 m; shrub 1.5 m; flowers red; 31 Dec 1955, *J. J. Wurdack & J. V. Monachino, 41054* (type, US). Amazonas: Caño Guaviarito, Río Manapiare, Río Ventuari, in dry secondary woodland between Camp Verada and Camp Tigre, alt. 200–900 m; virgate subshrub or shrub to 2 m; flowers red; 5 Feb. 1951, *Bassett Maguire, Kathleen D. Phelps, Charles B. Hitchcock & Gerald Budowsky 31780* (paratype, NY). Cerro Huachamacari, Río Cunucunuma, rain forest between Culebra and Camp I, alt. 400 m; flowers red; 21 Dec 1950, *Bassett Maguire, R. S. Cowan & John J. Wurdack 29972* (paratype, US); Serranía Parú, Río Parú, Caño Asísa, Río Ventuari, in tree-fall clearing in slope forest, locally frequent; alt. 800 m; woody herb, unbranched, 1–2.5 m; flowers red; 13 Feb 1951, *R. S. Cowan & John J. Wurdack 31441* (paratype, US); 11 Feb 1949, *Kathleen D. Phelps & Charles B. Hitchcock s.n.* (paratype, NY).

Pseuderanthemum maguirei Leonard, sp. nov. Fig. 41.

Frutex gracilis, caulibus subquadrangularibus, glabris; lamina foliorum elliptica vel oblongo-obovata, usque ad 16 cm longam et 5 cm latam, graciliter acuminata, basi angustata, aliquando firma, integra, utrinque glabra vel parce et minute hirsuta, costa et venis (6–8 paribus) subtus aliquanto prominentibus, supra obscuris, cystolithis nullis; petioli graciles glabri vel parce hirtelli; racemi terminales, usque ad 7 cm longos, rhache hirtella, pilis ascendentibus, albis, usque at 0.6 mm longos; bracteae rigidae, basi 1.25 mm latae, sursum subulatae, subulata, basi 0.75 mm lata, hirtella, pilis eglandulosis, patulis vel ascendentibus, usque ad 0.16 mm longos, pilis glandulosis, patulis, usque ad 0.66 mm longos; corolla 15 mm longa, alba, lobo medio labii inferioris purpureo-maculato, tubo 1 cm longo, basi 1.25 mm lato glabro, sursum dense puberulo, pilis glandulosis et eglandulosis intermixtis, ca. 0.03 mm longis, ad os 3 mm lato, labio superiore bilobato, lobis anguste ovatis, 4 mm longis, 2 mm latis, apice obtusis, labio inferiore trilobato, lobis obovatis 4 mm longis, 2 mm latis, apice rotundatis,

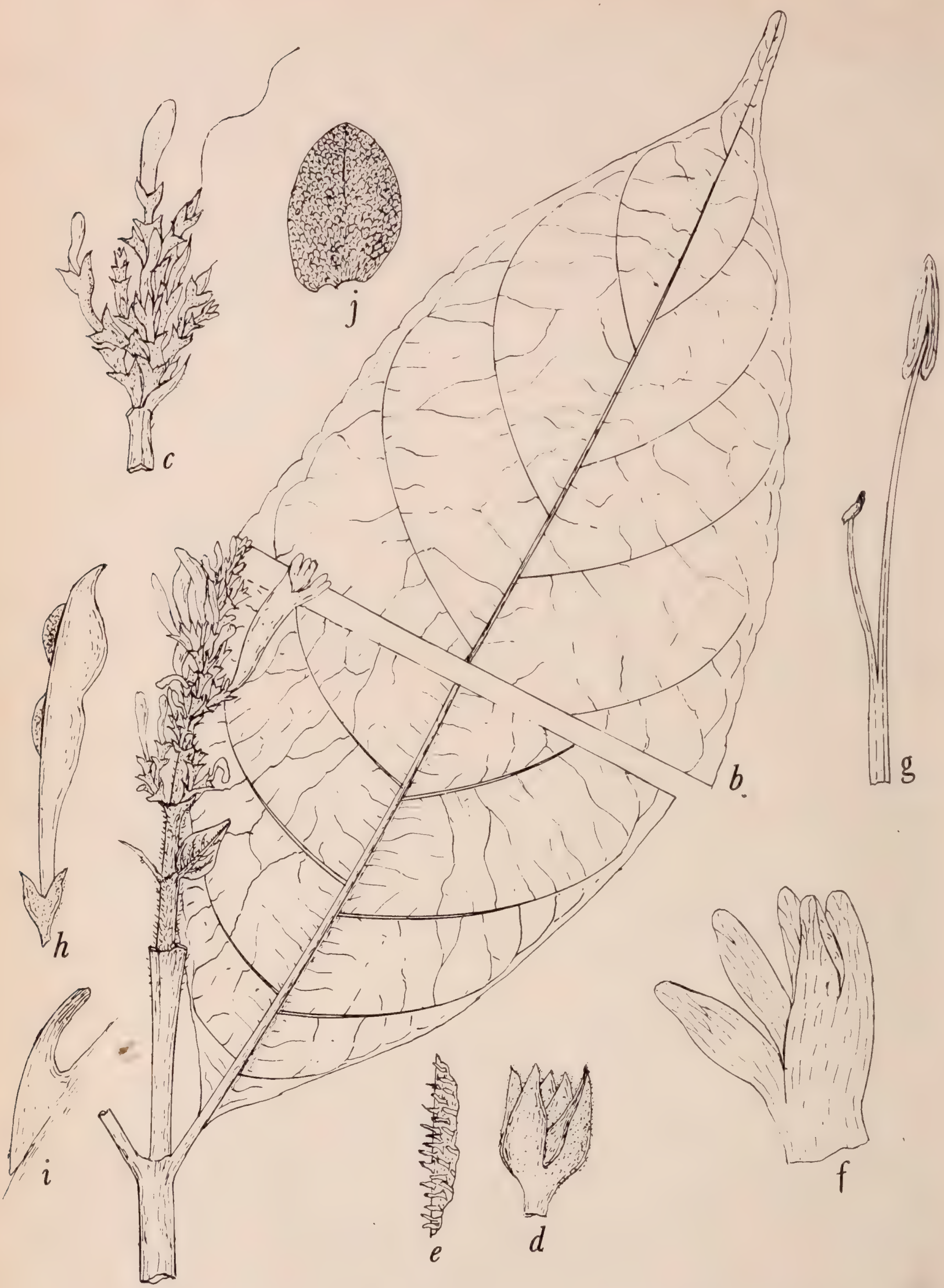


FIG. 40. *Odontonema venezuelense* Leonard (a, b, f, g, *Wurdack & Monachino 41054;* c-e, *Maguire, Kathleen D. Phelps, Hitchcock & Budowsky 31780;* h–j, *Kathleen D. Phelps & Hitchcock s. n.,* 11 Feb 1949). a, tip of plant showing lower portion of leaf (lower surface) and inflorescence, × 0.5; b, upper part of leaf blade (upper surface), × 0.5; c, portion of inflorescence, × 3; d, calyx, × 6; e, portion of inflorescence, × 20; f, tip of corolla, × 1.5; g, stamen and staminode, × 4; h, one of the valves of a capsule, × 1.5; i, retinaculum, × 5.7; j, seed, × 4.

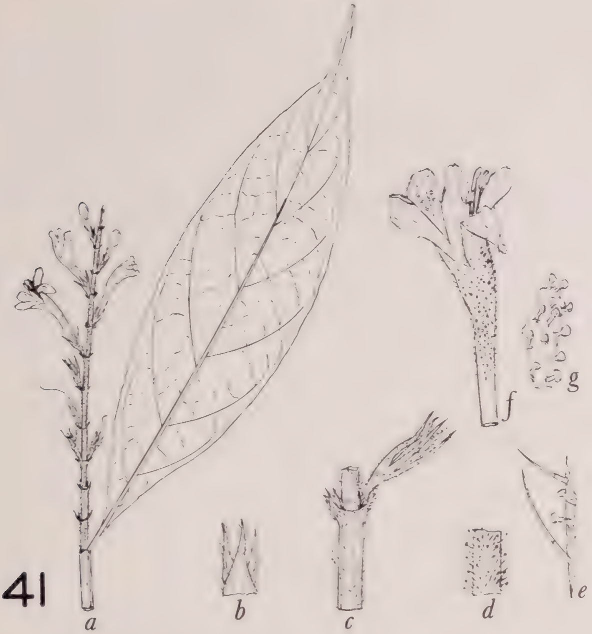


FIG. 41. *Pseuderanthemum maguirei* Leonard (*Maguire & Politi 27941*). a, tip of plant, × 0.5; b, bract and bractlets, × 5; c, portion of inflorescence enlarged to show pubescence, × 4; d, section of calyx segment enlarged to show pubescence, × 8; e, portion of calyx enlarged still further to show hairs, × 20; f, corolla, × 2; g, portion of corolla tube enlarged to show glandular hairs, × 50.

minute et graciliter pubescentibus; stamina vix exserta, filamentis 6.5 mm longis, basi minute pilosa, sursum glabris, antheris 2 mm longis, glabris; staminodia 0.75 mm longa, subulata; ovarium glabrum; capsulae ignotae; stylus 19 mm longus, basi minute hirtellus, sursum glaber; stigma minutum, bilobatum.

VENEZUELA: Amazonas: Cerro Sipapo (Paráque), vicinity of Base Camp; slender shrub with white flowers; 25 Dec 1948, *Bassett Maguire & Louis Politi 27941* (type, NY; fragment of type, US).

Ruellia malaca Leonard, sp. nov. Fig. 42.

Suffrutex, caulibus erectis, simplicibus vel ramosis, usque ad 2 m altos, molliter tomentosis, canescentibus, subteretibus; lamina foliorum oblongo-ovatis, usque ad 30 cm longam et 12 cm latam, apice acuminata, basi angustata, aliquanto firma, integra vel undulata, supra molliter puberula vel subglabra, subtus dense et molliter puberula, pilis plus minusve patulis, rectis vel curvatis, usque ad 0.32 mm longos, costis et venis (11 vel 12 paribus) aliquanto prominentibus; petioli usque ad 4.5 cm longos, dense tomentosi vel minute puberuli; paniculae terminales, usque ad 13 cm longas et 10 cm latas, dense et molliter pilosae vel subtomentosae, pilis plus minusve glandulosae; bracteae caducae, oblongae, usque ad 2 cm longas, 4 mm latas, puberulae; flores caduci; calycis segmenta submembranacea, lineari-lanceolata, usque ad 3 cm longa, 4 mm lata, acuminata, dense et molliter puberula, costa et venis obscuris; corolla pubescens, flava, 5 vel 6 cm longa, tubo curvato, basi 8 mm lato, prope os 2 cm lato, limbo obliquo 4 cm lato, lobis rotundatis, 1.5 cm latis; stamina exserta, usque ad 10 cm longa, filamentis glabris, antheris oblongis, 9 mm longis, 4 mm latis, glabris, lobis basilaribus 4 mm longis; capsulae oblongo-ovatae, 3 cm longae, 1 cm latae, apice obtusae, dense puberulae, pilis basi conicis, vitreis, semina plana, 5 mm longa et lata, madefacta subtiliter mucoso-puberula; retinacula subcarinata, curvata, 7 mm longa, 0.5 mm lata, apice truncata, laciniata.

VENEZUELA: Bolívar: Río Suapure, locally abundant at east base of Cerro Pijiguao (north end of Serranía Suapure about 70 river km from mouth), alt. 110 m; herb 2 m; flowers pale yellow; 19 Jan 1956, *J. J. Wurdack & J. V. Monachino 41287* (type, US). Entre rocas en las riberas de un arroyo en la selva del Salte de Para, alt. 300 m; arbusto delgado, hasta de 3 m de alto; fis. amarillas; 3 May 1939, *Llewelyn Williams 11383* (paratype, US). Amazonas: Cerro Guanay, Caño Verada, occasional in deciduous woodland between Campo Verada and Campo M. Pérez, alt. 900–1100 m; subshrub; branches herbaceous; flowers pale yellow; 30 Jan 1951, *Bassett Maguire, Kathleen D. Phelps, Charles B. Hitchcock & Gerald Budowsky 31667* (fruiting specimen; paratype, US).

The flowers and bracts on falling leave conspicuous raised scars (up to about 20) crowded on a more or less conelike rachis, this 1–4 cm long. Although not very closely related, the species reminds one of *R. bourgaei* Hemsl. of Mexico. The specific epithet is from the Greek word μαλακός, meaning soft (Latin mollis) in allusion to the velvety puberulence.

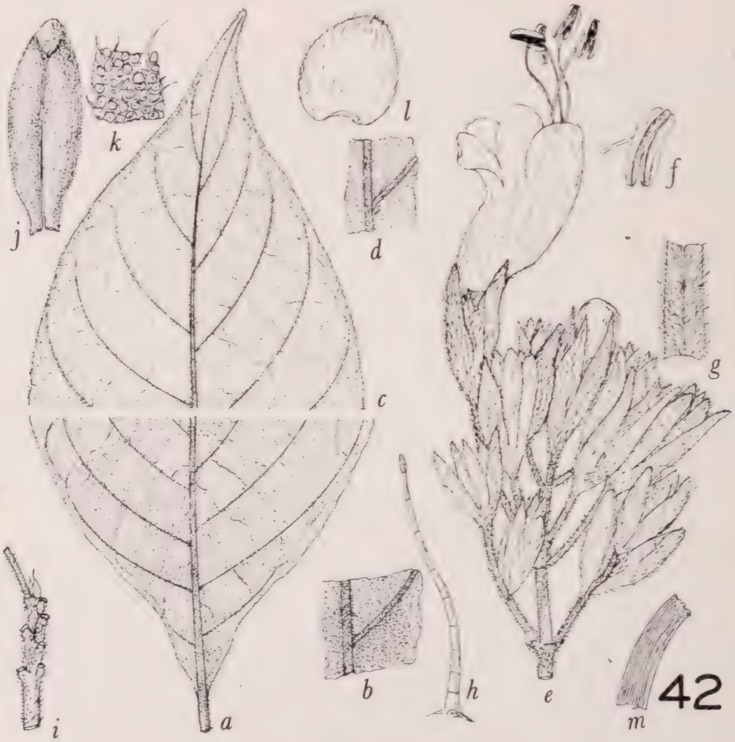


FIG. 42. *Ruellia malaca* Leonard (a–h, *Wurdack & Monachino 41287;* i–m, *Maguire, Hitchcock & Budowsky 31667*). a, basal portion of leaf blade (lower surface), × 0.5; b, part of lower surface of leaf blade enlarged to show pubescence, × ca. 2; c, upper portion of leaf blade (upper surface), × 0.5; d, part of upper surface enlarged to show pubescence and cystoliths, × ca. 2; e, inflorescence, × 0.5; f, anther, × 1; g, section of calyx lobe enlarged to show pubescence, × 1; h, hair from pedicel, × 110; i, rhachis of inflorescence, × 1; j, capsule, × 1; k, portion of capsule enlarged to show bulbous bases of the hairs, × 15; l, seed, ×5; m, tip of retinaculum, × 3.3.

APOCYNACEAE[5]

Ambelania oleaefolia var. **riparia** Monachino, var. nov.

Haec varietas a var. *oleaefolia* statura altiore 3–6 m alta et foliis latioribus 2–4.5 cm latis recedit.

Differs from the savanna var. *oleaefolia* Monachino in its greater height, 3–6 m (instead of 0.2–0.8; "2 m" in *Maguire et al. 30553*), and broader leaves, 2–4.5 cm wide (instead of 0.7–3 cm). The corollas in our specimens are larger, the tube being 2.5–3 cm long, the lobes about 3 cm long, 8–12 mm wide. The stamens are inserted about 7 mm from the base of the tube, the anthers are 5.8 mm long. The habitat is riparian.

VENEZUELA: Amazonas: frequent along Caño Pimichín between Río Guainía and Pimichín, alt. 30–140 m; tree 3–6 m, flowers white; 2 Jul 1959, *J. J. Wurdack & L. S. Adderley 43279* (holotype, NY). Occasional along Caño Yapacana, alt.–125 m; shrub 3–5 m, flowers white, fruit green; 17 Jun 1959, *Wurdack & Adderley 43021* (paratype, NY).

Aspidosperma exalatum Monachino, Mem. N. Y. Bot. Gard. **10**:120. 1959. Fig. 43 A–D.

VENEZUELA: Amazonas: frequent along Caño Temi just above Yavita, alt. 130 m; shrubby tree 2–5 m, flowers white; 11 Jun 1959, *J. J. Wurdack & L. S. Adderley 42935*. Locally frequent along Río Guainía just below Banderita, alt. 110 m; shrub 2–5 m, flowers white; 26 Jun 1959, *Wurdack & Adderley 43195*.

This species was originally described from fruiting material. Flowering specimens have now been collected. *A. exalatum* belongs in the series *Nobiles* in Woodson's revision (1951). It has no very close relative, although its cymose inflorescence suggests *A. album* (Vahl) R. Ben. ex M. Pichon. Inflorescence cymose, ample, the flowers crowded; calyx closely sordid-ashy to brownish-tomentellous without, the sepals ovate, unequal in size, obtusish, 1.8–2.2 mm long; corolla carnose, completely glabrous outside, the tube cylindric, angulate, 5 mm long, papillate within, the lobes spiral-contorted to the right in aestivation, dolabriform, 4.5 mm long, 1.5 mm wide, acutish at the apex; stamens inserted near the middle of the corolla tube, the anthers about 1 mm long; ovary glabrous, narrowed to the style at the apex.

Aspidosperma verruculosum var. **laeve** Monachino, var. nov.

Haec varietas a var. *verruculoso* foliis supra levibus, venis non prominulis, et indumento inflorescentiae ferrugineo recedit.

Differs from var. *verruculosum* Muell.-Arg. in its leaves smooth above, the veins not prominulous or verruculose-elevated. The leaves, rather, are like those of *A. spruceanum* Benth. ex Muell.-Arg. or forms of *A. album* (Vahl) R. Ben. ex M. Pichon. The indumentum in the young inflorescence is ferruginous instead of gray. The corolla-lobes are 1.5 mm long (flowers not fully expanded); the anthers 0.7 mm long.

VENEZUELA: Amazonas: locally frequent along Caño Pimichín between Río Guainía and Pimichín, alt. 130–140 m; tree 5–8 m, buds cream; *J. J. Wurdack & L. S. Adderley 43280* (holotype, NY); Río Guainía, along Caño Pimichín, alt. 125–135 m; slender tree 10 m, fruit brown; 14 Apr 1953, *Maguire & Wurdack 35663* (paratype, NY).

The fruit (*M. & W. 35663*) was described under questionably determined *A. album* in Mem. N. Y. Bot. Gard. **10**: 119 (1958). The flowers now prove the

---

[5] By Joseph Monachino.

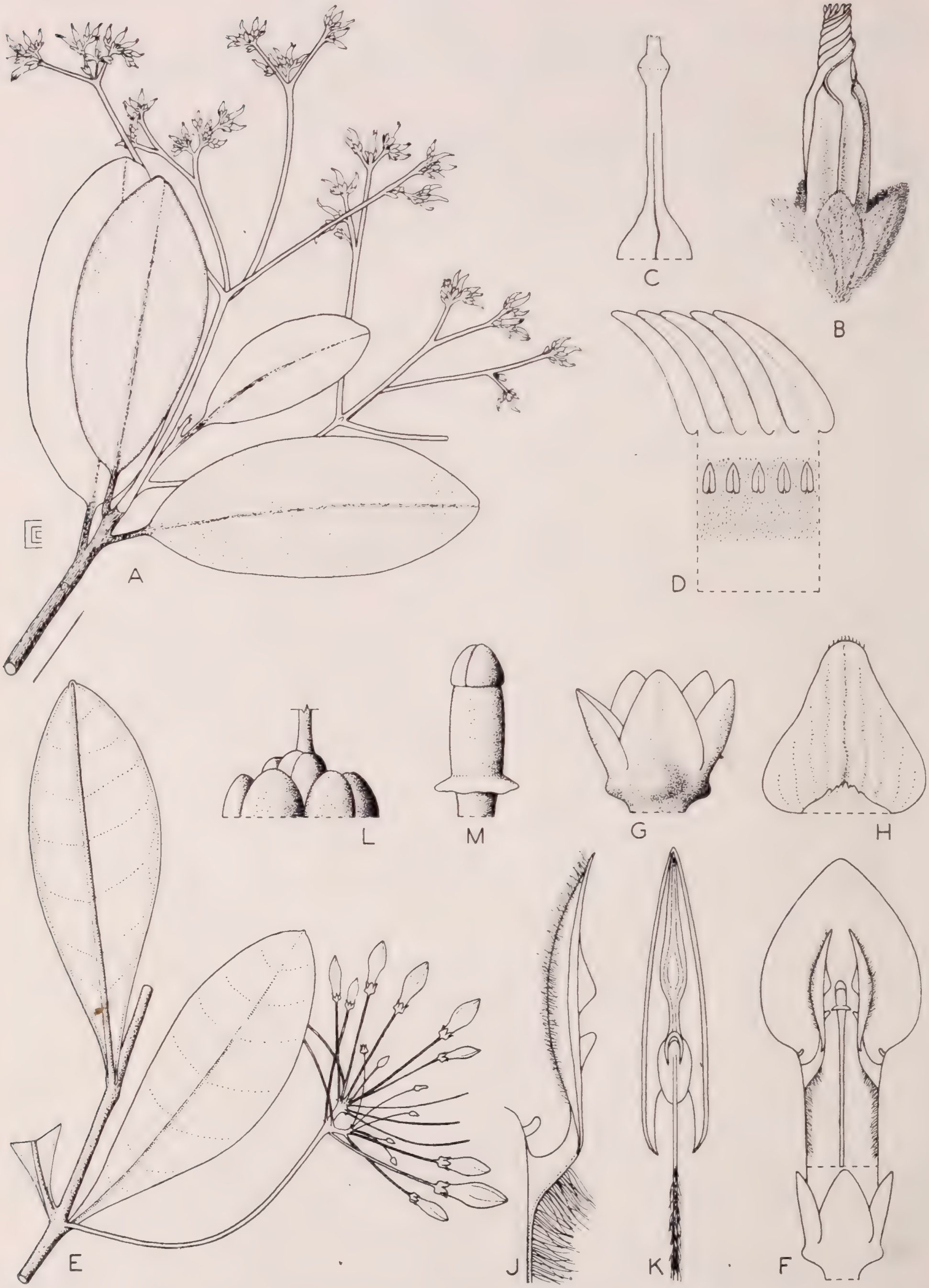


Fig. 43. A–D, *Aspidosperma exalatum* (*Wurdack & Adderley 43195*). A, habit, × 0.2. B, bud, × 5. C, ovary, style, & stigma, × 15. D, corolla, open view, × 5. E–L, *Prestonia arborescens* (*Wurdack & Adderley 43232*). E, habit, × 1/5. F, bud, × 3. G, calyx, × 5. H, sepal & squamellae, × 7.5. J, anther, lateral view, × 7.5. K, anther, dorsal view, × 7.5 L, nectaries & ovary, × 10; M, stigma, × 15.

proper affinity. It is possible, however, that the differences are more than varietal and this taxon deserves the rank of a distinct species.

Lacmellea pygmaea var. **latifolia** Monachino, var. nov.

Haec varietas a var. *pygmaea* foliis lanceolatis vel oblongis latioribus 1–3 cm latis recedit.

Differs from var *pygmaea* Monachino in its lanceolate or oblong, much broader leaves, 1–3 cm wide (instead of less than 0.5 cm). The flowers in our specimens are somewhat larger; corolla-tube 13 mm long, anthers 4.6 mm and style 2 mm long.

VENEZUELA: Amazonas: locally abundant in Sabana Cumare on right bank of Caño Cumara, Río Atabapo, 20 km above San Fernando de Atabapo, alt. 125 m; shrub 0.2–1 m, with abundant milky latex, flowers white, fruit green; 3 Jun 1959, *J. J. Wurdack & L. S. Adderley 42757* (holotype, NY). Occasional in Sabana El Venado, left bank of Caño Pimichín above Pimichín, alt. 140 m; shrub 0.2–0.4 m, flowers cream; 2 Jul 1959, *Wurdack & Adderley 43291* (paratype, NY).

A. pygmaea is known from only the Alto Río Orinoco. The typical variety with very narrow leaves was found in March, a drier month than June-July when var. *latifolia* was collected. It is unknown what the seasonal or local ecological effects on the gross morphology of the plant may have been. Such qualms are also entertained regarding the new variety proposed in the beginning of the present treatment of the Apocynaceae, *Ambelania oleaefolia* var. *riparia*, which is likewise distinguished chiefly on size differences.

Mandevilla obtusifolia Monachino, sp. nov. Fig. 44 A–G.

Fruticulus scandens, caulibus subteretibus hispidulis; foliis oppositis, petiolis 4–5 mm longis; laminis subcoriaceis glabris oblongis 2.5–5 cm longis, 1.2–2 cm latis, ad apicem rotundatis vel obtusis, ad basim rotundato-subcordatis, subtus pallidis; venis lateralibus rectis, 7–10 jugis indistinctis; inflorescentiis lateralibus racemoideis paucifloris; pedicellis 3 mm longis puberulis; lobis calycis deltoideo-lanceolatis, 2.5 mm longis, 1.3 mm latis, ciliatis puberulis; squamellis oppositisepalibus; corolla infundibulariforme, tubo infrastaminali 3 cm longo, intus piloso, gula 2.5 cm longa, lobis 3 cm longis, paene 3 cm latis; antheris 4.3 mm longis glabris 2 mm latis; ovario glabro; nectario annulari sub-5-lobulato 0.7 mm alto.

Woody vine, the stems brownish, slender, subterete, puberulent-hispulous. Leaves opposite; petioles 4–5 mm long; blades subcoriaceous, green and shining above, pallid beneath, essentially glabrous, glanduliferous along the midrib on the upper surface, oblong, generally broadest slightly above the middle, 2.5–5 cm long, 1.2–2 cm broad, rounded or broadly obtuse and minutely apiculate at the apex, rounded-subcordate at the base, becoming revolute at the margins, the lateral veins straightish, lightly ascending, submarginally connected, 7–10 pairs, faint beneath, slightly more prominent above, reticulation manifest by transmitted light, open. Inflorescences appearing axillary, racemoid, few-flowered, with 3–6 flowers; pedicels 3 mm long, faintly puberulent, the bracts deciduous, probably squamose; calyx-lobes deltoid-lanceolate, acutish at the apex, membranous at the margins, 2.5 mm long, 1.3 mm broad, ciliate, puberulent dorsally, the squamellae oppositisepalous, broadly deltoid, denticulate to lacerate, 0.7 mm high. Corolla bright yellow, showy, large, glabrous without, infundibuliform; infrastaminal tube 3 cm long, 3 mm wide (pressed), densely pilose within below the anthers, the hairs appressed, reflexed; throat 2.5 cm long, 1.5 cm wide

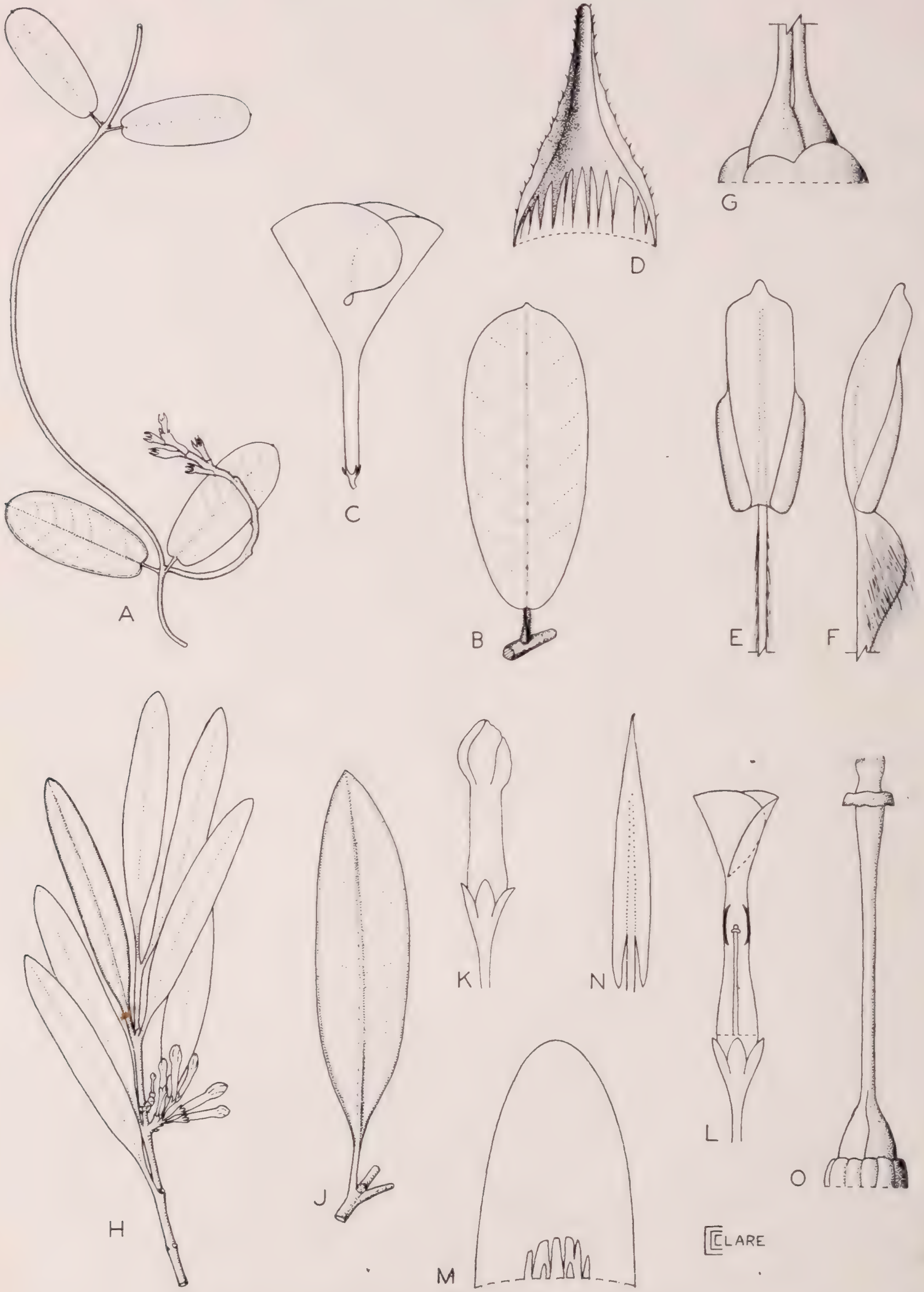


FIG. 44. A–G, *Mandevilla obtusifolia* (*Wurdack & Adderley 42993*). A, habit, × 0.5. B, leaf with glands, × 1. C, flower, × 0.5. D, sepal & squamellae, × 15. E, anther, adaxial view, × 7.5. F, anther, lateral view, × 7.5. G, ovary and nectaries, × 10. H–O, *Tabernaemontana tenuis* (*Wurdack & Adderley 42965* except J). H, habit, × 0.5. J (*Wurdack & Bunting 37612*), leaf, × 0.5 K, bud, × 2. L, flower, × 1.5. M, sepal & squamellae, × 20. N, anther, × 10. O, ovary, stigma, and nectaries, × 10.

(pressed); lobes broadly oval, rounded at the apex, 3 cm long, almost as broad. Anthers agglutinated to the stigma, oblong, sagittate, glabrous, 4.3 mm long, 2 mm wide, apiculate at the apex, the basal lobes blunt. Ovary glabrous, narrowed into the style; nectary annular, lightly 5-lobulate, about half the length of the ovary, 0.7 mm high.

VENEZUELA: Amazonas: along Río Atabapo between Manacal and Guarinume, alt. 125 m; vine climbing 2 m, flowers yellow; 12 Jun 1959, *J. J. Wurdack & L. S. Adderley 42993* (holotype, unicate, NY).

M. obtusifolia belongs in the subgen. *Exothostemon* in Woodson's monograph (1933). It is distinctive in its small, glabrous, apically rounded leaves pale beneath and faintly nerved. The stem is terete and much more slender than that of *M. turgida* Woodson and the habit is definitely climbing. In the field *M. obtusifolia* was confused with *Odontadenia glauca* Woodson, which was collected on the same trip. The two are rather similar in superficial appearance and habit.

Microplumeria anomala var. **parvifolia** Monachino, var. nov.

Haec varietas a var. *anomala* foliis parvioribus 3–7 cm longis 1.5–2.7 cm latis recedit.

Leaves smaller than those of var. *anomala* (Muell.-Arg.) Mgf., 3–7 cm long, 1.5–2.7 cm wide, paler beneath than above, the principal lateral nerves about 12 pairs (6–13); petiole very short. The corolla-tube is longer than those of the few available specimens of the typical variety, about 7 mm long.

VENEZUELA: Bolívar: Ciudad Bolívar, abundante, alrededores laguna de Los Francos, alt. ± 80 m; arbusto de flores verdosas, no llamativas, latex blanco, muy escaso; Apr 1954, *L. Aristeguieta 2162* (holotype, NY).

M. anomala var. *parvifolia* apparently does not differ from the typical variety (also known from Edo. Bolívar) in any essential flower or fruit character.

Prestonia arborescens Monachino, sp. nov. Fig. 43 E–M.

Arbor parva; foliis oppositis subsessilibus glabris valde coriaceis ellipticis useque ad oblanceolatos, 8–12 cm longis, 2–5.5 cm latis, subtus glaucis, ad apicem obtusis, ad basim angustatis; venis lateralibus 5-8 jugis; inflorescentiis subumbellatis, pedunculo 5–10 cm longo, pedicellis 2.5–6 cm longis; sepalibus ovatis, 1.7–3.3 mm longis, 2.3–3 mm latis, ad basim gibbosis; squamellis oppositisepalibus latis, at apicem denticulatis; tubo corollae 1 cm longo, extus glabro, intus piloso; appendicibus epistaminalibus 0.8 mm longis, annulo faucis aequantibus; antheris exsertis pilosis; filamentis prope summum tubi corollae insertis; ovario glabro; nectariis 5 crassis altitudine ovario subaequantibus.

Tree, 5–6 cm tall, the branchlets olivaceous brown, terete, the young parts puberulent-hispidulous, slightly roughish to the touch. Axillary and interpetiolar glands small, deltoid. Leaves opposite, subsessile, the petiole less than 3 mm long; blades becoming thickly coriaceous, glabrous, dull, glaucous-pallid beneath, elliptic to oblanceolate, (5–)8–12 cm long, 2–5.5 cm wide, the base narrowed into the petiole, the apex obtuse or with a short acumen, apiculate, the margins revolute, the principal lateral nerves slightly arcuate, submarginally connected, 5–8 pairs, 1–2 cm apart near the middle of the leaf, the reticulation obscure. Inflorescences soon appearing axillary, subumbellate, many-flowered, usually surpassing the subtending leaf, the peduncles 5–10 cm long, the pedicels slender and long, 2.5–6 cm long, puberulent. Sepals puberulent without, ovate, 1.7–3.3 mm long, 2.3–3 mm wide, gibbous at the base, obtuse at the apex, their margins membranous; squamellae oppositisepalous, semicircular, 0.7 mm long, faintly toothed at the apex. Corolla hypocrateriform, pink-tinged white with the lobes yellowish at the base; tube 1 cm long, 4.5 mm wide (pressed), glabrous outside, pilose at the upper half within, the epistaminal appendages scale-like, ovate, laterally flattened, about 0.8 mm long and almost as wide, attaining the faucal annulus, the callous faucal annulus papillose; corolla-lobes dextrorsely convolute in aestivation, becoming reflexed, obliquely oval-orbicular subdolabriform, 17 cm long, 13 mm wide, glabrous outside, sparsely ciliate at the apex, finely veined, papillose toward the base within. Anthers agglutinated to the stigma, connivent into an exserted cone, pilose dorsally, lanceolate, 5-6 mm long, acute at the apex, sagittate at the base, the lobes 1 mm long; filaments inserted near the summit of the corolla-tube, laterally flattened, pilose on the lower margin, decurrent as a sharp ridge on the corolla-tube, the free part about 2.3 mm long, 0.8 mm broad. Ovary rounded at the apex, glabrous; style slender, the clavuncle 2 mm long, the stigma apiculi blunt; nectaries 5, thick, about the height of the ovary.

VENEZUELA: Amazonas; Río Guainía, occasional along Caño San Miguel just above Limoncito, 15 km from Río Guainía, alt, 100–140 m; tree 5–6 m, with clear sap, corolla white, pink-tinged, the deflexed lobe-bases yellowish; 28 Jun 1959, *J. J. Wurdack & L. S. Adderley 43232* (holotype, NY).

Dr. Wurdack, who saw this distinctive plant in the field, has confirmed its arborescent, not liana, habit. The species is best placed in sect. *Annulares* in Woodson's treatment (1936), but the calyx-lobes are small and non-foliaceous. It recalls *P. leptoloba* Monachino.

Tabernaemontana tenuis Monachino, sp. nov. Fig. 44 H–O.

Frutex vel arbor parva, ramulis gracilibus; foliis glabris coriaceis concoloribus oblongis usque ad sublanceolata 4–11 cm longis, 0.8–3 cm latis, ad apicem rotundatis vel obtusis, ad basim angustatis; reticulo venarum indistincto, venis lateralibus plusminusve rectis patenti-adscendentibus, 15–25 jugis; inflorescentiis lateralibus brevibus paucifloris glabris; pedicellis 4 mm longis; sepalibus ovatis glabris 2.3 mm longis 1.6 mm latis obtusis; squamellis paucis; tubo corollae 12 mm longo intus medio pubescenti; lobis corollae glabris tubo aequantibus 8 mm latis; staminibus in medio tubi corollae insertis; antheris gracilibus sessilibus glabris 3.7 mm longis, lobis 0.5 mm longis; ovario glabro; nectario crateriformi integro 0.8 mm alto; clavunculo 0.8 mm alto, apiculis brevibus obtusis.

Shrub or small tree, 0.3–4 m tall, the branchlets slender, less than 6 mm thick, greyish. Leaves opposite, completely glabrous, coriaceous, concolor, dull; petioles 1 cm long, faintly verrucose, the axillary glands many, linear, less than 1 mm long; blades oblongish to sublanceolate, 4–11 cm long, 0.8–3 cm broad, narrowed into the petiole at the base, rounded to obtuse at the apex, not acuminate, their margins revolute, brown-puncticulate beneath (constant?), the venation not prominent, the principal lateral nerves faintly raised, straightish, spreading-ascending, 15-25 pairs. Inflorescences quickly appearing lateral, cymose, short, few-flowered, about 8-flowered, essentially glabrous. Pedicels glabrous or microscopically hirtellous, 4 mm long. Sepals almost free, glabrous, thin, broadly ovate, slightly unequal in size, 1–2.3 mm long, 1.6 mm broad, obtuse, the squamellae oppositisepalous, about 5 or 6 in number. Corolla hypocrateriform, white with a yellow throat, glabrous without; tube 11–12 mm long, 2–3.3 mm wide (pressed), slightly constricted at the middle and the orifice, hirtellous to puberulent within about the middle; lobes becoming reflexed, glabrous, broadly asymmetric-obovate, about equal to the tube in length, 8–11 mm wide, folded in bud, the apex of the bud appearing ovate, obtuse. Stamens inserted at about the middle of the corolla-tube, the anthers attached by their backs for about 1.7 mm, glabrous, sagittate, slender, 3.5–3.7 mm long, the basal lobes 0.5 mm long, obtusish or at least not finely pointed, the apex not exserted, short-filamentous. Ovary glabrous, obtuse at the apex, the nectary crateriform, entire, adnate to the ovary, 0.8 mm high; clavuncle 0.8 mm high, the collar 0.7 mm broad, the apiculi short, blunt.

VENEZUELA: Amazonas: locally frequent in Sabana Manacal, Río Atabapo, 15 km above Guarinume, alt. 125 m; shrub 0.3–1 m, corolla white with yellow throat; 12 Jun 1959, *J. J. Wurdack & L. S. Adderley 42965* (holotype, NY). Río Siapa, Casiquiare, along lower part of Caño Hechimoni, 8 km above mouth of Río Siapa, alt. 100–130 m; small tree, corolla white, the throat yellow; 9 Feb 1954, *Bassett Maguire, J. J. Wurdack & G. S. Bunting 37612* (paratype, NY). Frequent along Caño Temi just above Yavita, alt. 130 m; spare tree 2–4 m, corolla white with yellow throat, ''palo de boya''; 11 Jun 1959, *Wurdack &Adderley 42936* (paratype).

The collection *37612* has much broader leaves than those of the type, longer, and sublanceolate rather than oblongish.

The leaf-shape of *T. tenuis* suggests *T. rimulosa* Woodson, and the two species are probably closely related. But the leaves of our plant are much smaller, and the stems and other parts are comparatively very slender.

LEGUMINOSAE—MIMOSOIDEAE[6]

Calliandra resupina Cowan, sp. nov. Fig. 45.

Arbuscula resupina, ramulis dense albo-villosis, stipulis deciduis, 9–10 mm longis, ca. 3 mm latis, lanceolatis, acutis, dense albo-villosis extus, intus glabris. Petiolus 3–5 mm longus, albo-villosus, rhachi (0–)9–10 mm longa, villosa; pinnae (1–)2-jugatae, 5–5.5 cm longae, elliptico-oblongae, foliolis 18–21-jugatis, sessilibus oblongis, rigidis, ad basim truncato-obtusis, ad apicem obtusis, pinnarum medio laminis 8–10 mm longis, ca. 2.5 mm latis, glabris nitidisque supra, infra albo-villosis, marginaliter ciliatis recurvatisque, costa valde excentrica, plana supra, infra salienti, venis obscuris. Inflorescentiae axillares et terminales, capitatae, pedunculo 22-33 mm longo, albo-villoso, bracteis ca. 7 mm longis, albo-villosis extus, intus glabris. Perianthium albo-sericeum extus, rubrum, calycis tubo campanulato, 2 mm longo, lobis triangularibus, 1 mm longis, petalis ca. 5 mm longis, ad apicem obtusis. Filamenta 21 mm longa, glabra. Gynoecium et fructus ignota.

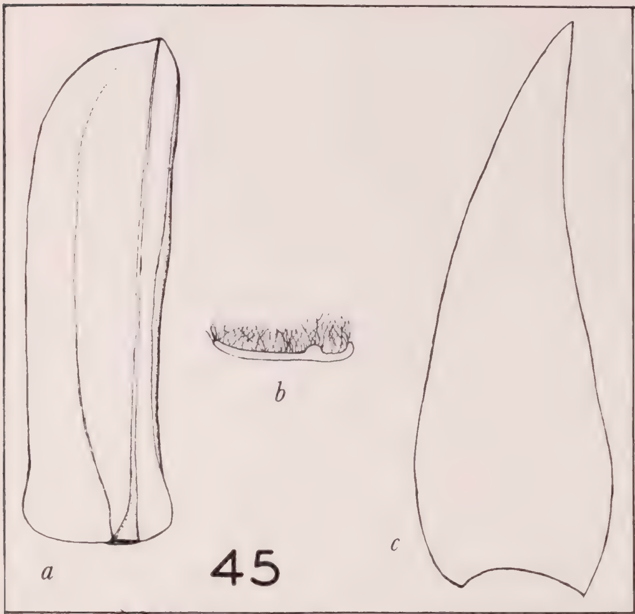
VENEZUELA: Bolívar: occasional on rocky slopes and elevations in drainage of Río Aponguao, alt. 1200 m, Gran Sabana; repent or trailing shrub; fls bright red; 27–28 Mar 1952, *Bassett Maguire 33643* (holotype, US No. 2281820).

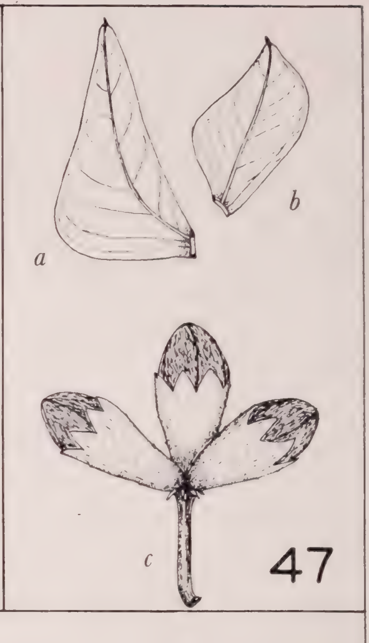
C. resupina (resupinus: ''lazy,'' in allusion to the decumbent habit of the plant) is most nearly related to *C. tsugoides* and *C. rigida* from Venezuela and British Guiana respectively; all three species are morphologically quite similar to such south Brazilian species as *C. hirsuticaulis* and *C. calycina.* The new species and its closest (both geographically and morphologically) relative, *C. tsugoides* may be distinguished by the following key:

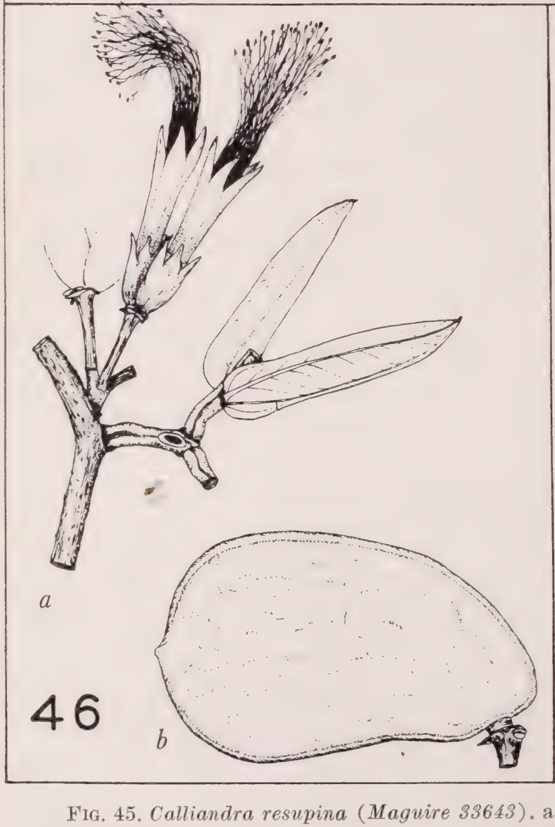
1. Stipules 5 mm long, 1 mm wide, obtuse; pinnae 2–4-jugate, the leaflets 35–45-jugate, glabrous, ecostate. Filaments 40 mm long. *C. tsugoides.*

---

[6] By Richard S. Cowan.







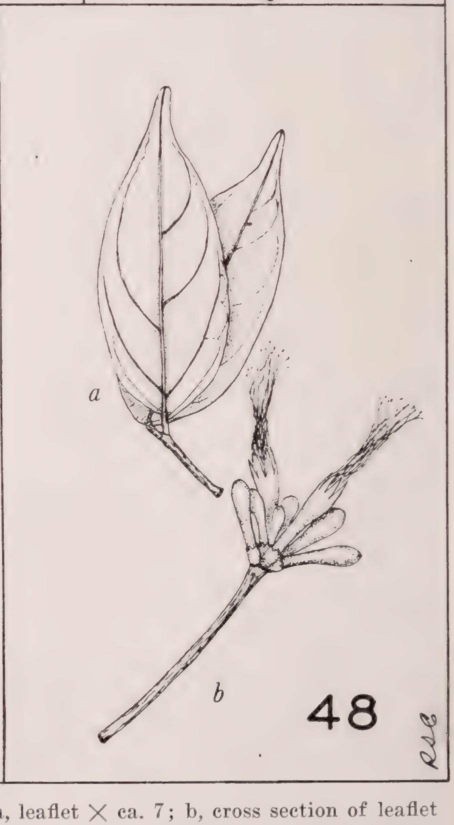


FIG. 45. *Calliandra resupina* (*Maguire 33643*). a, leaflet × ca. 7; b, cross section of leaflet to show pubescence, ca. × 7; c, stipule, ca. × 7. FIG. 46. *Pithecellobium arenicola* (*Maguire et al. 37568*). a, portion of leaf and inflorescence, × 1; b, immature fruit, × 1. FIG. 47. *Pithecellobium consanguineum* (*Maguire et al. 41878*). a, one leaflet of terminal pair, × 1; b, one leaflet of median pair, × 1; c, immature inflorescence, × 1.5. FIG. 48. *Pithecellobium levelii* (*Level 73*). a, one pinna, × 0.5; b, inflorescence, × 1.

1. Stipules 9–10 mm long, 3 mm wide, acute; pinnae 1–2-jugate, the leaflets 18–21-jugate, albo-villose beneath, the costa strongly expressed, excentric. Filaments 21 mm long. *C. resupina.*

Inga gracilifolia Ducke.

VENEZUELA: Amazonas: along Río Cuao, alt. 125 m; tree 12 m tall; fls green with pale yellow filaments; 19 Jan 1949, *Maguire & Politi 28439.*

This is probably a very widespread species in northern South America, at least in the Amazon Basin. It was described on the basis of collections from Belém, one from the Rio Trombetas in northern Brazil, and one from western Brazil on the Rio Solimões. This Venezuelan collection represents a very significant northward extension of range and this is the first report of the species in Venezuela.

Inga racemiflora Ducke.

VENEZUELA: Amazonas: locally frequent along flooded forest edge south and east of Maroa, Río Guainía, alt. 130 m; shrub 3–5 m; corolla greenish-white; filaments white; 4 Jul 1959, *Wurdack & Adderley 43313;* occasional along Río Yatua between mouth and Laja Catipan, alt. 110–120 m; tree 6 m; fls white; 13 Jul 1959, *Wurdack & Adderley 43430.*

The presence of this species in southwestern Venezuela is not unexpected, since it has been known previously from the Rio Negro region of northwestern Brazil. This is the first report for Venezuela, however.

Pithecellobium aquaticum (Pittier) Cowan, comb. nov.

Macrosamanea aquatica Pittier, Bol. Soc. Venez. Ci. **11**:15. 1950.

Four recent collections have been referred to this species (*Maguire et al. 36204, 36253; Wurdack & Adderley 42732; Level 70*); all are from the San Fernando de Atabapo region, just up-river from the type locality. Since the generic name under which Pittier published his new species is not generally accepted, it seems advisable to provide the combination under *Pithecellobium.*

Pithecellobium arenicola Cowan, sp. nov. Fig. 46.

Arbor 2–3 m alta vel arbuscula 0.3–1.5 m alta, ramulis puberulis, stipulis caducis, non visis. Petiolus 9–16 mm longus, puberulus, ad apicem glandula ovali 3 mm longa ornatus, rhachi (0–)12–16 mm longa, puberula, pinnis 1–2-jugatis, petiolo secondario ca. 4 mm longo, rhachillis 7.5–16 cm longis, puberulis, petiolulis nullis. Foliola 16–24-jugata, rigida, glabra (puberula costa supra excepta), leviter falcata, lanceolata ad oblongo-lanceolata, 20–30 mm longa, 5–7 mm lata, ad basim inaequilateraliter rotundata, ad apicem acuta et mucronata, costa excentrica venis primariisque leviter impressis supra, infra leviter salientibus. Flores capitati, capitulis in racemis terminalibus dispositis, capitularum pedunculo 5–10 mm longo, dense puberulo, bracteis glandulas conspicuas ferentibus. Calyx minuto-strigulosus, viridis, tubo 6–7.5 mm longo, lobis 2.5–3.5 mm longis, anguste triangularibus, acutis; corolla luteo-gilva, minute strigulosa, tubo 15–17 mm longo, lobis 5.5–6 mm longis, ca. 2 mm latis, triangulari-lanceolatis. Filamenta glabra, ca. 40 mm longa, tubo ca. 20 mm longo; ovarium minute strigulosum, sessile. Fructus immaturus plus minusve oblongus, minute strigulosus, compressus.

VENEZUELA: Amazonas: occasional in savanna on right bank of Río Pacimoni 50 km above mouth, alt. 100–140 m; shrub 0.3–1.5 m tall; fls white; 7 Feb 1954, *Bassett Maguire, John J. Wurdack & George S. Bunting 37568* (holotype, US Nos. 2281823, 2281824); frequent in savanna on left bank of Caño Hechimoni 8 km above mouth, alt. 100–130 m; small tree 2–3 m; calyx green; corolla tan-cream; filaments white, anthers yellow; 9 Feb 1954, *Maguire, Wurdack & Bunting 37624.*

The shape of the leaflets of this savanna species (the specific epithet refers to the sand-inhabiting characteristic) separates it rather easily from its nearest relatives, of which *P. aquaticum* is perhaps as near as any. The latter species is also characterized by very small, insignificant glands on leaves and inflorescences; similarly placed glands are quite conspicuous in *P. arenicola.*

Pithecellobium basijugum Ducke.

VENEZUELA: Amazonas: frequent in flooded forest along uppermost Río Yatua, alt. 100–140 m; small bushy tree; corolla cream; stamens basally white, apically rose; 7–8 Dec 1953, *Maguire, Wurdack & Bunting 36724;* along uppermost Río Yatua, alt. 100–140 m; shrub 2.5 m, cauliflorous; filaments basally white, apically pink; 27 Oct 1957, *Maguire, Wurdack & Maguire 41958.*

Ducke described this species, based on collections from northwestern Brazil, but there are now more gatherings from southeastern Colombia than from Brazil. This first report from Venezuela is from the adjacent region, so the actual extension of range is not great.

Pithecellobium consanguineum Cowan, sp. nov. Fig. 47.

Arbor parva (?), ramulis glabris, conspicue lenticellatis, stipulis persistentibus, late triangularibus, obtusis, 0.5 mm longis. Petiolus 33–40 mm longus, leviter minute puberulus glaucusque, glandula sessili, elliptica, 3 mm longa, 1.5 mm lata, rhachi 5.5–7 cm longa, leviter minuto-puberula et glauca, pinnis 3–4-jugatis, petiolis secondariis 5–10 mm longis, rhachillis 7–9.5 cm longis, minuto-puberulis et glaucis. Foliola sessilia, glabra vel marginaliter sparse minuto-ciliolata, inaequilateralia, oblonga, ad apicem acuta mucronataque, 16–18 mm longa et 8–10 mm lata (foliolis terminalibus exceptis, his oblique lanceolatis, 3–3.5 cm longis, 10–15 mm latis), costa valde excentrica, venis lateralibus inconspicuis. Flores immaturi, sessiles, capitati, capitulis in racemis dispositis, capitularum pedunculo 13–16 mm longo, minuto-striguloso, bracteis glanduliferis. Calyx minute strigulosus, tubo 7–8 mm longo, lobis 2–3 mm longis, ovato-triangularibus, acutis; corolla pallidior quam calyce, dense aureo-strigulosa. Androecium et gynoecium immaturum. Fructus ignotus.

VENEZUELA: Amazonas: Río Guainía, alt. 120–140 m, clearing at Limoncito, left bank of Caño San Miguel 15 km above mouth; 14 Oct 1957, *Bassett Maguire, John J. Wurdack & William M. Keith 41878* (holotype, US No. 2267420).

The nearest relative of this new species is surely *P. spruceanum* and the degree of proximity is emphasized by the choice of specific epithet for it (consanguineus: "related by blood"). Although the flowers of *P. consanguineum* are not fully expanded, it is obvious that they are smaller than those of its near relative and the distribution of pubescence on the perianth is different. The color difference between the calyx and corolla (in the dried material) of the new species is also striking; the calyx is dark brown and the corolla is so densely buff-pubescent as to contrast sharply with the calyx. The two species also differ in number of pinnae and leaflets, and the latter are rather differently shaped.

Pithecellobium ferrugineum Benth.

BRAZIL: Rio Branco: occasional on open slopes of Serra Sabang, alt. 1370 m; small tree 4–8 m; fls bright red; 16–18 Dec 1955, *Maguire & Maguire 40325.*

This collection matches quite well a photograph of *Schomburgk 994* which in most respects represents this species very well. Both collections have more pairs of pinnae and leaflets than are recorded in the original description. However, in the latter, Bentham considers his material as ''only small and imperfect''; furthermore, the leaf difference is easily within the range of variation in number of parts. This is the first report of the species since the type collection and the first report for Brazil.

Pithecellobium levelii Cowan, sp. nov. Fig. 48.

Arbor 8–10 m alta, ramulis foliisque glabris, stipulis caducis, non visis. Petiolus (15–)25–34 mm longus, pinnis unijugatis, pinnarum rhachi 18–31 mm longa, foliolis unijugatis, petiolulis 4–6 mm longis, laminis coriaceis, calloso-marginatis, ellipticis ad ovato-ellipticas, 8–9.5 cm longis, 3.5–4.5 cm latis, ad basim acutis, ad apicem obtuse acuminatis, costa venis primariisque faciebus ambobus plus minusve salientibus. Inflorescentiae terminales, racemiformes, capitulis solitariis vel fasciculatis, capitulorum pedunculo 20–37 mm longo, minute striguloso, floribus sessilibus. Calycis tubus 2–2.5 mm longus, minuto-strigulosus, lobis 0.5–0.7 mm longis, triangularibus, minuto-strigulosis; corolla alba, minute strigulosa, tubo 10–11 mm longo, lobis 3–3.5 mm longis, 1–2 mm latis, lanceolatis, acutis. Filamenta glabra, ca. 40 mm longa, tubo haud vel breviter exserto. Ovarium minute strigulosum, style glabro. Fructus ignotus.

VENEZUELA: Amazonas: Caño Cupaven, opposite mouth of Río Atabapo, alt. 150 m; tree 10 m; fls white; 11 May 1954, *J. Silverio Level 73* (holotype, US No. 2281812); occasional along Río Orinoco just about mouth of Río Atabapo, alt. 125 m; tree 8 m; fls white; 1 Jun 1959, *Wurdack & Adderley 42730.*

After so many exploratory parties have passed through this region of Venezuela, it seems proportionately less likely that new species would still be collected along the principal river routes. The collector of the type material, however, is a particularly acute observer, with an unexcelled ''eye'' for what we generally refer to as specific differences. The several years of association with the expeditions of Maguire et al. have developed him as an outstandingly capable botanical collector. It is, therefore, a pleasure to name this very distinctive new species for him.

The relationships between *P. levelii* and other species of the genus (sensu lato) are not at all clear. It differs from all others either in the number of leaflets and/or the type of inflorescence.

Pithecellobium villiferum Ducke.

VENEZUELA: Amazonas: along Río Guainía between Comunidad and Santa Rita, alt. 120 m; tree 6 m; fls white; 8 Jul 1959, *Wurdack & Adderley 43351.*

The type locality, along the upper Rio Negro of northern Brazil, is in the southern part of the physiographic province in which the above cited collection was made, so it is not an unexpected first report for Venezuela. Since it has also been reported from Tafelberg in the interior of Suriname, it may be a more widely ranging species than earlier suspected.

LEGUMINOSAE—CAESALPINIOIDEAE

Aldina petiolulata Cowan, sp. nov. Fig. 59.

Arbor 40 m alta, 60 cm diametro [DBH], ramulis dense microstrigulosis et lenticellatis, stipulis non visis. Petiolus 4–7 cm longus, gracili-cylindricus, glaber, rhachi 7.5–8.5 cm longa, glabra, gracili-cylindrica; petioluli 15–20 mm longi, glabri, graciles, teretes, laminis ellipticis, 8.5–10 cm longis, 3.5–4.5 cm latis, ad basim acutis usque ad subobtusos, ad apicem obtusis et plerumque rotundatis, glabris nitidisque supra, infra pallidioribus, furfaceo-ceriferis et albo-microstrigulosis, costa impressa et venulis primariis planis supra, infra costa et venulis primariis plus minusve salientibus. Inflorescentiae 15–23 cm longae, paniculatae, axe aureo-sericeo, bracteis bracteolisque persistentibus, triangularibus, pedicello 2.5–3 mm longo, alabastris ca. 13 mm longis. Calyx ca. 11 mm longus, extus aureo-sericeus, lobis 2–3, intus villosulis; petala alba, obovata, valde cucullata ca. 15 mm longa et 10 mm lata, glabra. Filamenta 12 mm longa, antheris 4.5 mm longis, 1 mm latis, anguste oblongis. Stylus 2 mm longus, glaber; ovarium 3 mm longum, 2 mm latum, ovato-oblongum, sericeum, gynophoro 2 mm longo, obcuneato, sericeo. Fructus ignotus.

VENEZUELA: Amazonas: frequent in slope forest near Camp 3, alt. 700–800 m, Cerro de la Neblina, Río Yatua; tree 40 m × 60 cm [DBH]; bark with red clear exudate; petals and filaments white; anthers cream; 30 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42555* (holotype, US No. 2267456).

The length of the petiolules is emphasized by the choice of specific epithet for this new species, which is most nearly related to *A. occidentalis*. They are distinguished in the following key, which also includes other species of this genus described since my review of it (Mem. N. Y. Bot. Gard. **8**:103. 1953.)

1. Leaflets completely glabrous on the lower surface as well as on the upper. 2.
1. Leaflets pubescent on the lower surface, sometimes obviously so but often minutely. 3.
2. Mature buds 7–8 mm long, petals 7–9 mm long; stipe of the ovary as long as or shorter than the ovary; leaflets broadly ovate to lanceolate; inflorescence much branched 10. *A. heterophylla.*
2. Mature buds 15 mm long, petals 15–20 mm long; stipe of the ovary 2-3 times as long as the ovary; leaflets oblong, oblong-oval, or oblong-ovate; inflorescence racemose or lax and sparsely branched. 4a. *A. latifolia var. latifolia.*
3. All parts except the upper leaf surface fuscous-velvety. Calyx usually split into two parts 3. *A. kunhardtiana.*
3. Pubescence where present minute, densely and closely appressed (at least on dried specimens). Calyx split into 3–5 irregular parts. 4.
4. Leaves mostly 7–11-foliolate. 5.
4. Leaves usually not over 5-foliolate (to 7-foliolate in *A. aurea* and *A. occidentalis*). 6.
5. Leaflets 3–4 cm wide, lanceolate-oblong, the apices long-acuminate; mature buds about 1.5 cm long; petals oblong, 2 cm long, 0.8 cm wide; filaments about 1.5 cm long; ovary 5 mm long with a stipe up to 10 mm long. 2. *A. polyphylla.*
5. Leaflets (5.5–) 7.5–11 cm wide, oblong or oblong-oval, the apex abruptly short-acuminate or acute; mature buds 2–2.5 cm long; petals obovate-orbicular with a cuneate base, 3–4.5 cm long, 2.5–3.5 cm wide; filaments 2.5–3.5 cm long; ovary 7–8 mm long (sometimes two ovaries produced per flower), the stipe 1.5–1.8 cm long. 1a. *A. insignis* var. *insignis.*
6. Hairs on lower leaflet surface strictly appressed, directed toward the apex and the margin of the leaflet, the apex of the leaflets not retuse or rotund. 8.
6. Hairs on lower leaflet surface at first erect or suberect, collapsed and more or less decumbent on drying, the apex of the leaflets rotund and retuse. 7.
7. Leaflets 10–13 cm long, 5.5–6.5 cm wide, the lower leaflet surface evenly glaucous; mature buds about 2.5 cm long; petals 3.5–4.5 cm long; stipe densely pubescent, 6–9 mm long; style sparsely gray-sericeous. 1b. *A. insignis* var. *retusa.*

7. Leaflets 7–8.5 cm long, 3.5–4.5 cm wide, the lower leaflet surface obscurely pruinose-lepidote; mature buds about 1 cm long; petals 2 cm or less in length; stipe of the ovary glabrous, about 1 mm long; style glabrous. 9. *A. occidentalis.*
8. Ovary glabrous or subglabrous. 8. *A. macrophylla.*
8. Ovary densely pubescent. 9.
9. Stipe of the glabrescent ovary about 10 mm long, twice or more times as long as the ovary. 4b. *A. latifolia* var. *pubescens.*
9. Stipe of the persistently pubescent ovary 2.5 mm long or shorter, never longer than the ovary at anthesis. 10.
10. Venation strongly salient, conspicuous on both surfaces of the leaflets. 5. *A. reticulata.*
10. Venation never conspicuous, usually obscure on the upper surface of the leaflets. 11.
11. Leaflets acute to acuminate apically, the upper and lower surfaces markedly discolorous. 12.
11. Leaflets obtuse to rounded-obtuse, the upper and lower surfaces not markedly discolorous. 13.
12. Leaflets tesselate and appressed-puberulous beneath. 6. *A. discolor.*
12. Leaflets aureo-pubescent and not at all tesselate on the under surface. 6′. *A. aurea.*
13. Leaf axis appressed-puberulous, the petiolules 5–7 mm long. 6″. *A. elliptica.*
13. Leaf axis glabrous, the petiolules 15–20 mm long. 6‴. *A. petiolulata.*

Bauhinia chalkos Cowan, sp. nov. Fig. 49.

Frutex scandens 5 m altus, ramulis dense pilosulis, stipulis caducis, non visis. Petiolus 6–6.5 cm longus, dense pilosulus, lamina breviter bilobata, lobis 20–23 mm longis, triangularibus, obtusis ad subacutis, suborbiculari ad oblatam, 13–13.5 cm longa, 14–16 cm lata, ad basim valde cordata, 11-nervia, nerviis leviter impressis supra, infra salientibus, venulis subobscuris, faciebus superioribus glabris, inferioribus nitido-cupreis. Inflorescentiae racemosae, plerumque terminales, 11–21.5 cm longae, axe dense pilosulo, bracteis bracteolisque deciduis, 2.5–3 mm longis, oblanceolatis, acutis, pedicello 3–5 mm longo, dense pilosulo. Calyx cupreo-strigulosus, late campanulato-ovoideus, valde alato-costatus, tubo 4 mm longo, lobis 6.5 mm longis, 5.5 mm latis, ovato-oblongis, apice reflexo, suborbiculari, ca. 2 mm diametro. Corolla gilva, cupreo-sericea extus, intus glabra, petalorum unguiculo ca. 7 mm longo, lamina orbiculari, 13–16 mm diametro, ad apicem rotundata. Filamenta parce villosa, ca. 11 mm longa; stylus glaber; ovarium dense cupreo-sericeum. Fructus ignotus.

VENEZUELA: Amazonas: along Río Casiquiare just above Piedra Guanare, alt. 110 m; woody vine climbing 5 m; fls cream; 25 Jun 1959, *John J. Wurdack & L. S. Adderley 43174* (holotype, US No. 2281798).

The coppery color of the under surfaces of the leaves in this new species is the basis for the specific epithet (χαλκός: ''of copper''). In this respect *B. chalkos* is quite similar to *B. cupreonitens*, to which it is surely rather closely related. The new species has much larger flowers; the reflexed tips of the calyx lobes are much smaller; the leaves are larger, differently shaped, and with 2–4 fewer principal veins; and finally, the geographic range of the two species is disjunct.

Campsiandra angustifolia Spruce ex Benth.

VENEZUELA: Amazonas: along Río Orinoco just below mouth of Caño Yapacana, alt. 125 m; tree 15 m; corolla white, rose-flushed; stamens red; 18 Jun 1959, *Wurdack & Adderley 43029;* infrequent along Río Casiquiare just below Capihuara, alt. 130 m; tree 12 m; petals white, red-flushed outside; stamens deep red; 26 Jul 1959, *Wurdack & Adderley 43636.*

These two collections are the first reported in Venezuela but the range extension is not great, since the species occurs in nearby parts of Colombia and Brazil.

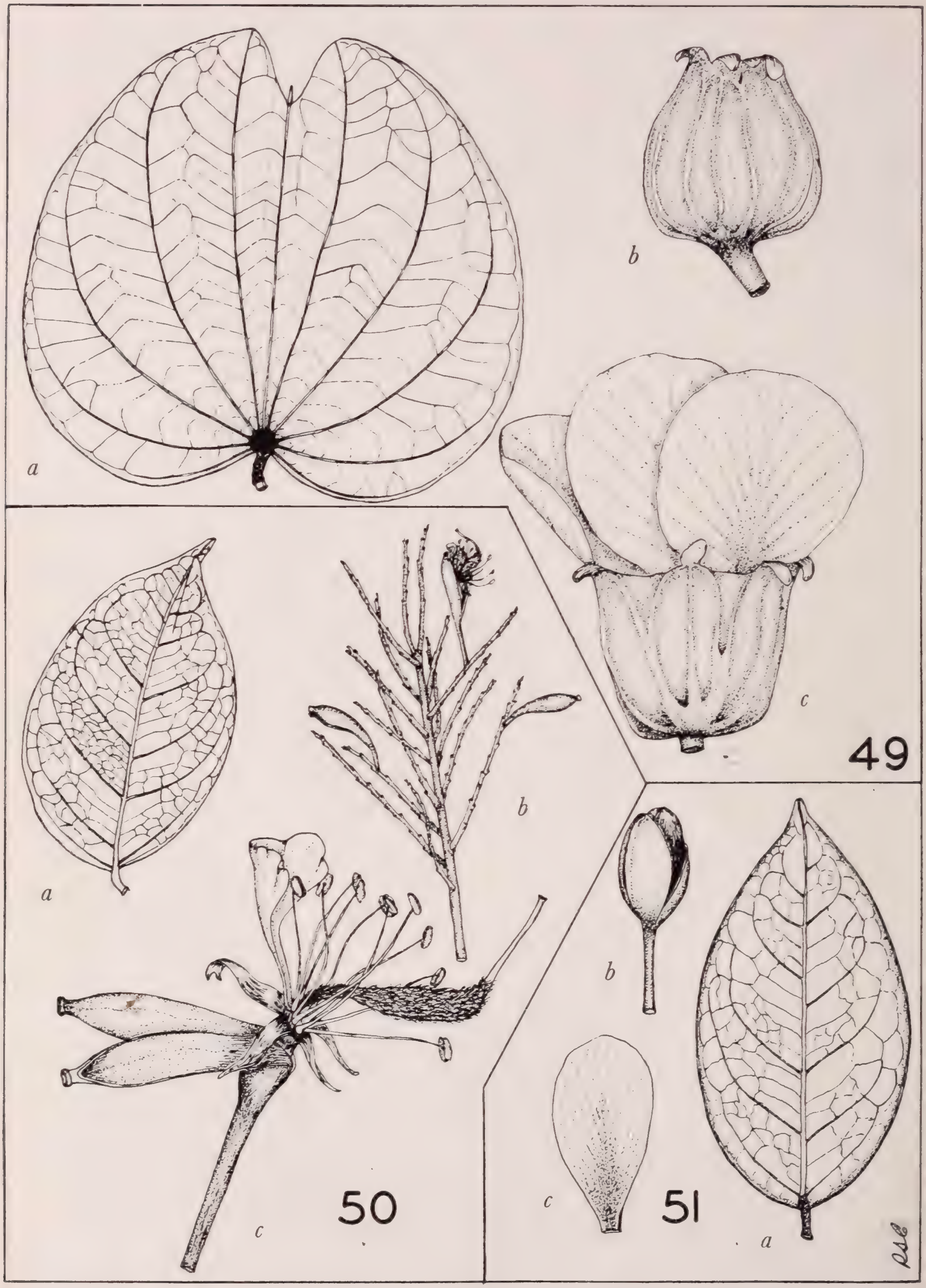


FIG. 49. *Bauhinia chalkos* (*Wurdack & Adderley 43174*). a, leaf, × 0.5; b, mature bud, × 2; c, flower, × 2. FIG. 50. *Dicymbe neblinensis* (*Maguire, Wurdack & Maguire 42568*). a, one leaflet, × 0.5; b, inflorescence, × 0.5; c, open flower, × 2. FIG. 51. *Dicymbe pharangophila* (*Maguire, Wurdack & Maguire 42503*). a, one leaflet, × 0.5; b, mature bud, × 0.5; c, petal, × 0.5.

Campsiandra macrocarpa Cowan.

VENEZUELA: Amazonas: infrequent along Río Yatua for 30 km above Piedra Arauicaua, alt. 100–140 m; tree 15 m; petals white; stamens red; 20 Oct 1957, *Maguire, Wurdack & Maguire 41932.*

When I described this species (Mem. N. Y. Bot. Gard. **10**:147. 1958) only leaves and immature fruits were available for study, but it seemed so distinct that this appeared to be a prudent course. The above-cited collection now furnishes additional characteristics that strongly support that action. These distinguishing features are presented in the following supplementary description: Inflorescence a terminal panicle of racemes 15 cm long, the axes densely puberulous; bracts and bracteoles very minute, the pedicels ascending at anthesis but soon recurved, 14–17 mm long, densely puberulous, the hypanthium obconic, 7 mm long, ca. 5 mm in diameter, strigulose. Sepals 3.5–4 mm long, 3.5–4.5 mm wide, very broadly ovate, rounded-obtuse, strigulose externally, glabrous within; petals 15.5 mm long, 8 mm wide, obovate, rounded-obtuse, glabrous except densely ciliolate marginally. Filaments 50–65 mm long, glabrous, the anthers oval, 2 mm long, 1 mm wide, villose. Gynoecium glabrous, the style ca. 35 mm long, the ovary narrowly oblong, ca. 5 mm long.

In my key (Mem. N. Y. Bot. Gard. **8**:111. 1953) this species will key out near *C. comosa* var. *laurifolia*, but it is distinct from all other taxa in the genus by the size of the flower parts, in addition to the leaf and fruit characters; most of these, especially the perianth, are considerably larger than in any of the other taxa.

Elizabetha leiogyne Ducke.

VENEZUELA: Amazonas: frequent along uppermost Río Yatua, alt. 100–140 m; tree 15–30 m; calyx pale green, petals white; 25–26 Oct 1957, *Maguire, Wurdack & Maguire 41952;* locally frequent along stream in slope forest just beyond Camp 2, Cerro de la Neblina, alt. 200 m; tree 25 m; bracts pinkish, petals white, apically pink-tinged; 2 Nov 1957, *Maguire, Wurdack & Maguire 41986.*

In his review of the genus Ducke (Trop. Woods **37**:21. 1934) gives the range of this species as upper Rio Negro region of Amazonas, Brazil, so its presence is not unexpected in the forests of adjacent Venezuela. These are the first collections reported from the latter country.

Dicymbe Spruce ex Bentham.

Since the preliminary review of this genus in 1957 (Mem. N. Y. Bot. Gard. **9**:337–343. 1957), I have described two additional new species and now still two more new ones require such treatment. Keys are presented below to associate the new taxa with their nearest relatives and to distinguish from each other the members of assemblages that include new species.

In the paper referred to above, the genus was divided into several sections; in a recent paper Fasbender (Lloydia **22**:139. 1959) mentions these sections as having been "invalidated by subsequent findings (Cowan, 1958)." It is necessary to correct the author's misinterpretation of the additional information presented in the latter reference. In the first place, the original treatment was specifically described as "preliminary;" it was a tentative arrangement of subgeneric taxa and nothing more. It is therefore not at all surprising that there is no support in the pollen morphology for my alignment. The fact is that some of the characteristics used in the preliminary key have since been found to be less precise than was originally thought, but this does not *invalidate* the subgeneric structure erected initially; the basic groups are, for the most part, just as recognizable now as then. Certainly, I do not intend to make any major modifications in my earlier treatment until the genus is much better known; new species are being added to it with every expedition to the Guayana region and a re-evaluation is not justified at this time. The genus is not so confused and complex as Fasbender states; rather it is a genus so poorly known in its component parts that it may tend to confuse the non-taxonomist.

Dicymbe neblinensis Cowan, sp. nov. Fig. 50.

Arbor 12 m alta, 15 cm diametro [DBH], ramulis novellis pilosulis, glabratis, stipulis caducis. Petiolus 17–20 mm longus, pilosulus, rhachi (2.5–)6–8 cm longa, pilosula, foliolis (2–)3-jugatis, petiolulis 5–6 mm longis, pilosulis, laminis inaequilateralibus, falcato-ovatis, 7–10 (–13) cm longis, 3–6 cm latis, ad basim obtusis (vel uno latere acuto), ad apicem acuminatis, glabris supra, infra parce pilosulis ad costam et ad venas primarias, costa et venis primariis planis supra, infra plus minusve salientibus. Inflorescentiae paniculatae, terminales, 12–15 cm longae, sericeae, bracteis caducis, triangularibus, 1–1.5 mm longis, extus sericeis, pedicello 9–12 mm longo, sericeo, bracteolis 11–15 mm longis, 3–3.5 mm latis, oblongo-lanceolatis, ad apicem stipitato-glandularibus, stipite ca. 1 mm longo, sericeis faciebus ambobus. Hypanthium ca. 5 mm longum, inaequilaterale, cylindricum; sepala 5–5.5 mm longa, 0.7–0.9 mm lata, duobus adaxialibus paene omnino connatis; petalum adaxiale expletum, pallido-flavum, glabrum intus, extus ad costam villoso-sericeum, unguiculo 5 mm longo, lamina oblata, 6 mm longa, 8.5 mm lata, petalo abaxiali ca. 3 mm longo, lineari, petalis ceteris ligulato-oblanceolatis, 8 mm longis, 1 mm latis. Filamenta 9–12 mm longa pilosula parce ad basim, antheris 1.7 mm longis, 0.8 mm latis, ovalibus, glabris Stylus glaber, ovario sericeo, ca. 5 mm longo, 2 mm lato, compresso-ellipsoideo gynophoro (in parte libera) ca. 1.5 mm longo, sericeo, in parte basali ad hypanthium adnato. Fructus ignotus.

VENEZUELA: Amazonas: in slope forest just north of Camp 3, Cerro de la Neblina, alt. 650–700 m; tree 12 m × 15 cm DBH; petal 1, pale yellow, turning bright yellow with age; stamens cream; 1 Jan 1958, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42568* (holotype, US No. 2267459).

This new species shares a number of characteristics with *D. stipitata* but is clearly distinct on the basis of the differences presented in the following key in which I have included all the known species of this section.

Key to the Species of *Dicymbe* sect. *Eremopetala*

1. Leaflets 1–2-jugate, the apex rounded, obtuse, or emarginate. 2.

1. Leaflets 3-jugate, infrequently 2-jugate, the apex acute to acuminate. 3.

2. Leaflets 2-jugate, 3–6.5 cm long, 2–3.5 cm wide, more or less emarginate. Petals and filaments sparingly strigulose, the stipe of the one complete petal 4 mm long, attenuate basally. 7. *D. yutajensis.*

2. Leaflets unijugate, 8–10 cm long, 5–5.5 cm wide, the apex rounded and entire. Petals and filaments villose; stipe of the one complete petal 2 mm long, cordate basally. 8. *D. froesii.*

3. Leaf axis and costa of the lower surface of the leaflets pubescent, the petiolules 5–6 mm long. Pedicels 9–12 mm long. Sepals 5–5.5 mm long; petals centrally pubescent, the blade of the complete petal oblate on a claw 5 mm long. Ovary densely sericeous. 8.′ *D. neblinensis.*

3. Leaves glabrous, the petiolules 7–8 mm long. Pedicels 6–7 mm long. Sepals 7.5 mm long; petals glabrous, the blade of the complete petal cordiform on a claw 6–8 mm long. Ovary glabrous except for the strigose abaxial suture. 8″. *D. stipitata.*

Dicymbe pharangophila Cowan, sp. nov. Fig. 51.

Arbor 6–12 m alta, ramulis foliisque glabris, stipulis caducis. Petiolus 13–18 mm longus, cylindricus, rhachi 22–38 mm longa, cylindrica, foliolis 1½–2-jugatis, petiolulis 7–10 mm longis, laminis rigidis, ellipticis ad ovatos, 10–12.5 cm longis, 5–6 cm latis, marginaliter revolutis, ad basim rotundo-obtusis, ad apicem obtuse acutis, infra nigro-punctatis, venulis planis faciebus ambobus, costa leviter salienti supra, infra valde salienti. Inflorescentiae usque ad 9 cm longas, axe microstriguloso, bracteolis crasso-coriaceis, 3 cm longis, 2 cm latis, ovalibus, microstrigulosis extus, intus glabris, pedicello 25 mm longo, dense microstriguloso. Hypanthium cupulare, 6–7 mm longum, ca. 10 mm diametro, microstrigulosum; sepala 4, glabra, duobus exterioribus ovato-oblongis, obtusis, 25 mm longis, 17–20 mm latis, duobus interioribus 28 mm longis, 7 mm latis, obtusis, anguste ellipticis; petala 5, alba, obtusa apiculataque, glabra intus, extus aureo-sericea, inaequalia, 4–5.5 cm longa, 1–2.5 cm lata, anguste elliptica ad obovata. Filamenta subulata, 6 cm longa, basilariter villosa, antheris 10 mm longis, 3 mm latis, anguste ellipticis, connectivo dorsualiter villoso. Stigma capitellatum, stylo 6 cm longo, glabro; ovarium oblongum, aureo-sericeum, 12 mm longum, 3 mm latum, sutura adaxiali valde dilata, gynophoro 5 mm longo, ad basim glabro, apicaliter sericeo. Fructus ignotus.

VENEZUELA: Amazonas: occasional in bottom of Cañon Grande SSW of Cumbre Camp, Cerro de la Neblina, alt. 1050–1100 m; tree 6–12 m; flowers white; 25 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42503* (holotype, US No. 2267450).

Dicymbe pharangophila (the specific epithet refers to the habitat of the species: φάραγξ: "valley"; φιλέω: "to love") is related to *D. altsoni*, *D. corymbosa*, and another new species described since my preliminary review, *D. bernardii*. The four taxa are readily distinguished by the following key:

1. Leaflets 2 jugate, punctate on the lower surface. 2.
1. Leaflets 3-6-jugate, not punctate beneath. 3.
2. Leaflet acute basally. Inflorescence velutinous; bracteoles 18 mm long, 10 mm wide, ovate; hypanthium 3 mm deep, 5 mm in diameter; filaments ca. 25 mm long. 3. *D. corymbosa.*
2. Leaflets rounded-obtuse. Inflorescence microstrigulose; bracteoles 30 mm long, 20 mm wide; hypanthium 6–7 mm long, 10 mm diameter; filaments 60 mm long. 3′. *D. pharangophila.*
3. Leaflets 5–6-jugate, microstrigulose on the lower surface. Pedicels 10–25 mm long, the bracteoles 15–18 mm long; ovary densely pilose. 2. *D. altsoni.*
3. Leaflets 3-jugate, glabrous. Pedicels 30–32 mm long, the bracteoles 25 mm long; ovary strigose and strigulose. 2′. *D. bernardii.*

Macrolobium Schreb.

More than a dozen new taxa have been added to this genus since I published a revisional study of it in 1953. To facilitate the placement of these taxa, as well as ones to be described later, in the taxonomic sequence established in my earlier study, I have recast the single key to the species. In the following pages, keys are presented to several series; the term is not intended to have any taxonomic status or phylogenetic significance but is used solely as a mechanical device to make possible future "updating" without extensive republication of keys. Each new taxon has been assigned a number that will serve to align it with its nearest relatives.

Key to the Series of Section 1, *Vouapa*

1. Leaflets 2–45-jugate or, if unijugate, with distinct petiolules. (Series 1.) 2.
1. Leaflets unijugate or unifoliolate (some leaves with the leaflets bijugate in *M. palustre* and very rarely in *M. punctatum*). (Series 2.) 5.
2. Leaflets with distinct petiolules 2.5–6 mm long. Bracts 5.5–17 mm long. Series 1a.
2. Leaflets sessile. Bracts smaller. 3.
3. Leaflets 2–6-jugate. Series 1b.
3. Leaflets 6–45-jugate. 4.
4. Leaflets (4–)6–10-jugate. Series 1c.
4. Leaflets 10–45-jugate. Series 1d.
5. Leaflets with a well-developed intramarginal nerve. Series 2a.
5. Leaflets without a well-developed intramarginal nerve. 6.
6. Ovary pubescent throughout or only marginally. Leaves always more than unifoliolate. 7.
6. Ovary glabrous or the leaves unifoliolate. 8.
7. Ovary pubescent on all surfaces. Series 2b.
7. Ovary pubescent only marginally. Series 2c.
8. Sepals five, free or the adaxial pair more or less united. Series 2d.
8. Sepals four, free. Series 2e.

Key to the Series of Section 2, *Stenosolen*

1. Leaflets 2–30-jugate. Series 3.
1. Leaflets unijugate. Series 4.

Key to the Species of Series 1a

1. Leaflets all or mostly 2–3-jugate. 2.
1. Leaflets all unijugate. 3.
2. Sepals five; bracts not over 12.5 mm long and 4 mm wide. Leaflets not conspicuously venose, the costa impressed on the upper surface. 21. *M. campestre* & vars.
2. Sepals four; bracts 14–17 mm long, 4–7 mm wide. Leaflets conspicuously venose, the costa and venules more or less salient. 21′. *M. spectabile.*
3. Leaflets not at all arcuate, basally equilateral. Bracteoles not fleshy or crassate. 22. *M. arenarium.*
3. Leaflets more or less arcuate, moderately to conspicuously inequilateral at the base. Bracteoles thick, fleshy. 4.
4. Leaflets rounded-obtuse apically, oblong, obovate-oblong, or broadly elliptic. 5.
4. Leaflets acute apically, elliptic to lanceolate-elliptic. 7.
5. Plants pubescent in some parts; leaflets 2–2.5 times as long as wide. Bracteoles about 10 mm long; petal 13–15 mm long. (23. *H. canaliculatum*) 6.
5. Plants glabrous on vegetative parts and on most flower parts; leaflets less than twice as long as wide. Bracteoles 7 mm long; petal about 6.5 mm long. 23′. *M. acrothamnos.*
6. Inflorescence axis strigulose. Leaflets with petiolules to 1 mm long, punctate. 23a. *M. canaliculatum* var. *strigulosum.*
6. Inflorescence axis very minutely puberulous. Leaflets with petiolules 3–10 mm long, not punctate. 23b. *M. canaliculatum* var. *canaliculatum.*
7. Costa of the leaflets strongly salient on their upper surface. Bracteoles 3.5–8 mm long; sepals 4–7.5 mm long; claw of the petal 4–5.5 mm long. 24. *M. punctatum.*
7. Costa of the leaflets strongly impressed on their upper surface. Bracteoles 12–14 mm long; sepals 10–11 mm long; claw of the petal ca. 10 mm long. 24′. *M. rubrum.*

Key to the Species of Series 1b

1. Peduncles 10–55 mm long. 2.
1. Peduncles not more than 6 mm long. 3.
2. Leaflets pilosulose-velutinous on the upper surface, pilose beneath. Inflorescence pilosulose. 13. *M. molle.*
2. Leaflets glabrous or sparsely puberulous basally on the lower surface. Inflorescence glabrous or minutely puberulous. 16. *M. multijugum* & vars.
3. Ovary densely to sparsely pubescent, marginally or on all surfaces. 4.
3. Ovary glabrous. 8.

4. Leaflets oval to oblong-obovate, apically rounded and retuse to emarginate. (17. *M. microcalyx*) 5.

4. Leaflets lanceolate, apically acute. 14. *M. jemmanii.*

5. Ovary villose on all surfaces. 17a. *M. microcalyx* var. *microcalyx.*

5. Ovary villose only marginally, laterally glabrous. 6.

6. Leaflets oval-oblong to oblong-obovate, the apex rounded, the lower surface glaucous; stipules caducous. 7.

6. Leaflets oval to elliptic, the apex attenuate but finally obtuse, the lower surface not glaucous; stipules persistent 20. *M. guianense.*

7. Leaflets mostly 3–5 cm long, 3–7-jugate, the rachis 2.5–10 cm long. 15. *M. discolor* & var.

7. Leaflets always less than 2 cm long, 2–3-jugate, the rachis 0.7–1.7 cm long. 17b. *M. microcalyx* var. *minimum.*

8. Leaflets distinctly punctate on the lower surface, oblong, 2.5–3.5 times as long as wide. Pedicels ca. 12 mm long. Bracteoles 12–17 mm long. 15′. *M. longipes.*

8. Leaflets epunctate, not over 2 times as long as wide, more or less oval to suborbicular. Pedicels 4–7 mm long. Bracteoles 5.5–10 mm long. 9.

9. Leaflets 2–3-jugate. Bracteoles pubescent on one or on both surfaces; filaments 10–20 mm long, villosulose basally or glabrous. 18. *M. montanum* & vars.

9. Leaflets 5–7-jugate. Bracteoles glabrous; filaments 25–35 mm long, strongly villose. 19. *M. urupaense.*

Key to Species of Series 1c

1. Leaflets 10–16-jugate. 2.

1. Leaflets usually less than 10-jugate . 3.

2. Leaflets pubescent beneath, oblong. Ovary pubescent at least marginally; filaments pubescent. 11. *M. flexuosum.*

2. Leaflets glabrous, oval-oblong. Ovary glabrous; filaments glabrous. 12. *M. furcatum.*

3. Leaflets not punctate. 4.

3. Leaflets punctate. 8.

4. Leaflets velvety-pubescent. Inflorescence pilosulose 13. *M. molle.*

4. Leaflets glabrous or at least not velvety. Inflorescence not pilosulose. 5.

5. Ovary pubescent on the margins. Leaflets with the lower surface often glacuous to ceriferous. 6.

5. Ovary glabrous. Leaflets not at all glaucous or ceriferous. 19. *M. urupaense.*

6. Leaflets oblong or oblong-oval to oblong-obovate, 5–35 mm wide, glaucous to ceriferous beneath. 7.

6. Leaflets linear, not over 3.5 mm wide, not glaucous or ceriferous beneath. 2′. *M. cataractarum.*

7. Leaflets oblong, 12–23 mm long, 5–8 mm wide. Pedicels 1–1.5 mm long. 11′. *M. anomalum.*

7. Leaflets usually oblong-oval to oblong-obovate, mostly 45–70 mm long and 10–35 mm wide. Pedicels usually 2–5 mm long. 15. *M. discolor* & vars.

8. Peduncle 2–4 mm long, the pedicels ca. 12 mm long. Leaflets 1–3-jugate. Fruits oblong. 15′. *M. longipes.*

8. Peduncle 10–55 mm long, the pedicels 2–5.5 mm long. Leaflets 3–9-jugate. Fruits oval to suborbicular. 16. *M. multijugum.*

Key to Species of Series 1d

1. Leaflets 10–30-jugate (–40-jugate in one variety of *M. gracile*), plane or nearly so. Hypanthium cupular. 2.

1. Leaflets 35–45-jugate, strongly convex. Hypanthium short-cylindric. 1. *M. taxifolium.*

2. Pedicels averaging 6 mm long (4–8 mm); bracteoles glabrous. Stipules persistent or caducous. 3.

2. Pedicels shorter; bracteoles pubescent on outer surface only or on both inner and outer surfaces. Stipules caducous. 4.

3. Stipules persistent; leaves oblong to lanceolate-oblong in outline, the leaflets rounded apically, entire or subentire. Bracts 3.5–5.5 mm long, 1–1.5 mm wide. 5. *M. huberianum.*

3. Stipules caducous; leaves elliptic or lanceolate in outline, the leaflets truncate apically, retuse to emarginate. Bracts 8 mm long, 2.5 mm wide. 6. *M. longipedicellatum.*

4. Ovary and bracteoles glabrous; peduncle 4–6 mm long. 12. *M. furcatum.*

4. Ovary and bracteoles more or less pubescent; peduncle shorter. 5.

5. Filaments more or less pubescent, sometimes only basally so. 6.
5. Filaments glabrous. 15.
6. Bracteoles pubescent on the inner surfaces (sometimes only sparingly so near the apex). Leaflets 8–40-jugate. 7.
6. Bracteoles glabrous on the inner surfaces. Leaflets 6–7-jugate 11'. *M. anomalum.*
7. Inflorescence less than 2 cm long. 8.
7. Inflorescence longer than 2 cm. 9.
8. Median leaflets four or more times as long as wide, essentially glabrous, 20–30-jugate. 2c. *M. gracile* var. *debile.*
8. Median leaflets three times as long as wide, pubescent on both sides, mostly 15-jugate. 2d. *M. gracile* var. *gracile.*
9. Leaflets obviously emarginate or retuse apically. 10.
9. Leaflets entire apically. 14.
10. Leaves lanceolate to oblong-lanceolate in outline, the leaflets with the costa salient. 11.
10. Leaves oblong in outline, costa salient or not. 12.
11. Inflorescences pilosulose; outer surfaces of the bracteoles pilose and flexuose-pilosulose. 4. *M. brevense.*
11. Inflorescences puberulous; flowers not known. 2b. *M. gracile* var. *machadoense.*
12. Median leaflets about 4 cm long, 1.5 cm wide, the venules prominulous. 11. *M. flexuosum* & var.
12. Median leaflets usually less than 2.5 cm long, 1 cm wide, the venules obscure to subobscure. 13.
13. Upper side of leaflet base angular-auriculate, the apex strongly emarginate. 3. *M. machaerioides.*
13. Upper side of leaflet base obtuse, the apex truncate-obtuse, retuse to emarginate. 10. *M. venulosum.*
14. Leaflets evenulose, the lower surface cano-strigulose. Bracts 5.5–7 mm long, elliptic-lanceolate. 10'. *M. evenulosum.*
14. Leaflets at least faintly venulose, the lower surface glabrous or somewhat pilosulose. Bracts 2.5–3 mm long, triangular-ovate 2a. *M. gracile* var. *confertum.*
15. Bracteoles pubescent on both surfaces. 16.
15. Bracteoles pubescent on outer surface only. 17.
16. Leaf rachis 3–3.5 cm long; leaflets about ten times as long as wide, the apex entire. 2'. *M. cataractarum.*
16. Leaf rachis 9–15 cm long; leaflets 2–3 times as long as wide, the apex retuse. 9. *M. froesii.*
17. Costa of leaflets distinctly salient on both surfaces. Bracteoles and pedicels lanulose-puberulous. Fruit three to four times as long as wide. 7. *M. longeracemosum.*
17. Costa impressed on the upper surface of the leaflets. Bracteoles and pedicels pilosulose. Fruit about one and a half times as long as wide. 8. *M. acaciaefolium.*

Key to the Species of Series 2a

1. Leaflets with the venules closely parallel and prominulous on both surfaces, the intramarginal nerve originating from the base of the costa, the apex strongly emarginate, rounded. 30. *M. retusum.*
1. Leaflets with the venules obscure or, if prominulous, not closely parallel, the intramarginal nerve formed by the anastomosing of primary veins, the apex entire, acute to acuminate. 25. *M. limbatum* & vars.

Key to the Species of Series 2b

1. Hairs of pubescence minutely ribbon-like, peg-like, or clavate (sub lente). 2.
1. Hairs of pubescence cylindric, neither clavate, ribbon-like, or peg-like. 4.
2. Hairs ribbon-like. Bracteoles thin, never fleshy. 27. *M. bifolium.*
2. Hairs peg-like or clavate. Bracteoles thick, spongy-fleshy. 3.
3. Hairs clavate. Leaflets to 15 cm long and 7 cm wide. Inflorescence axillary. 28. *M. latifolium.*
3. Hairs peg-like. Leaflets 32–39 cm long and 12–14 cm wide. Inflorescence ramuliflorous. 28'. *M. wurdackii.*
4. Inflorescences axillary to pseudo-terminal; sepals 5. 5.
4. Inflorescences cauliflorous to ramuliflorous; sepals 4. 6.
5. Leaflets strongly cordate at the lower side of the inequilateral base, rigid-coriaceous. Bracts 2.5 mm long, oblong-ovate. 31. *M. duckeanum*

5. Leaflets inequilaterally acute, not rigidly coriaceous. Bracts 1–1.5 mm long, triangular or ovate. 33. *M suaveolens* & vars
6. Leaflets rounded-obtuse on the lower side of the base, strongly salient-venose and thickly coriaceous. Stipules persistent, coriaceous-foliaceous. Bark of branchlets exfoliating. 32′. *M. exfoliatum.*
6. Leaflets acute basally, chartaceous, the venation not strongly salient. Stipules caducous. Bark of branchlets not exfoliating. 32. *M. amplexans.*

Key to the Species of Series 2c

1. Bracts ca. 5 mm long, 3 mm wide, never triangular, the bracteoles strigulose within, densely puberulous to pilosulose externally. Ovary pilosulose marginally. 29. *M. angustifolium.*
1. Bracts 1–1.5 mm long and wide, triangular, the bracteoles glabrous or minutely puberulous externally. Ovary minutely puberulous marginally. 2.
2. Inflorescence minutely puberulous; petal longer than the bracteoles, the blade orbicular to oblate, the claw distinct. Bracteoles oval, elliptic or oblong, 5–6.5 mm long, the hypanthium 1–2 mm long. 33. *M. suaveolens.*
2. Inflorescences glabrous; petal about as long as bracteoles, more or less spatulate, without a distinct claw. Bracteoles oblong to lanceolate, 8–13.5 mm long, the hypanthium 3–4 mm long. 38. *M. stenopetalum.*

Key to the Species of Series 2d

1. Leaflets punctate beneath, acuminate. Bracts caducous; gynophore pilosulose on adaxial surface. 33. *M. suaveolens.*
1. Leaflets epunctate, acute. Bracts persistent and closely imbricate on the basal part of the inflorescence axis; gynophore glabrous. 34. *M. parvifolium.*

Key to the Species of Series 2e

1. Leaves unifoliolate, the leaflets equilateral. Ovary pubescent. (37′. *M. unifoliolatum*) 2.
1. Leaves with unijugate, inequilateral leaflets. Ovary glabrous. 3.
2. Leaflets puberulous on the salient costa on the upper surface. Inflorescence 6.5–12 cm long, the bracts and bracteoles puberulous externally. Pedicels 4–9 mm long, densely puberulous. 37′b. *M. unifoliolatum* var. *schultesii.*
2. Leaflets glabrous, the costa impressed on the upper surface. Inflorescence shorter, the bracts and bracteoles glabrous. Pedicels shorter, glabrous. 37′a. *M. unifoliolatum* var. *unifoliolatum.*
3. Stipules and rachis rudiment persistent; hypanthium strongly zygomorphic. Leaflets often punctate. Belém and the Amazon Delta Region to southern Amazonas, Brazil. 37. *M. pendulum.*
3. Stipules and rachis rudiment caducous; hypanthium symmetric to asymmetric. Leaflets epunctate. Eastern Peru, upper Rio Negro and southwestern Venezuela. 4.
4. Filaments glabrous. Petioles 1.5–4 mm long; leaflets 1.5–5.5 cm long, 1–2.5 cm. wide, the lower side of the base rounded. 36. *M. savannarum.*
4. Filaments pubescent toward the base. Petioles 7–18 mm long; leaflets larger, the base cuneate. 5.
5. Leaflets always unijugate, 11.5–17 cm long, narrowly elliptic, the petioles 7–9 mm long. Inflorescence axis microscopically puberulous; pedicels 4–5 mm long; bracteoles 6.5 mm long, 3 mm wide, minutely puberulous externally. Sepals 5–5.5 mm long. Eastern Peru. 26. *M. klugii.*
5. Leaflets sometimes in part bijugate, 6.5–9.5 cm long, elliptic, the petioles 13–18 mm long. Inflorescence axis glabrous, the pedicels 6–8 mm long, the bracteoles 10–11 mm long, 5 mm wide, glabrous. Upper Rio Negro, Brazil. 35. *M. palustre.*

1. **Macrolobium taxifolium** Spruce ex Benth.

VENEZUELA: Amazonas: along Río Guainía between Comunidad and Santa Rita, alt. 120 m, 8 Jul 1959, *Wurdack & Adderley 43350.*

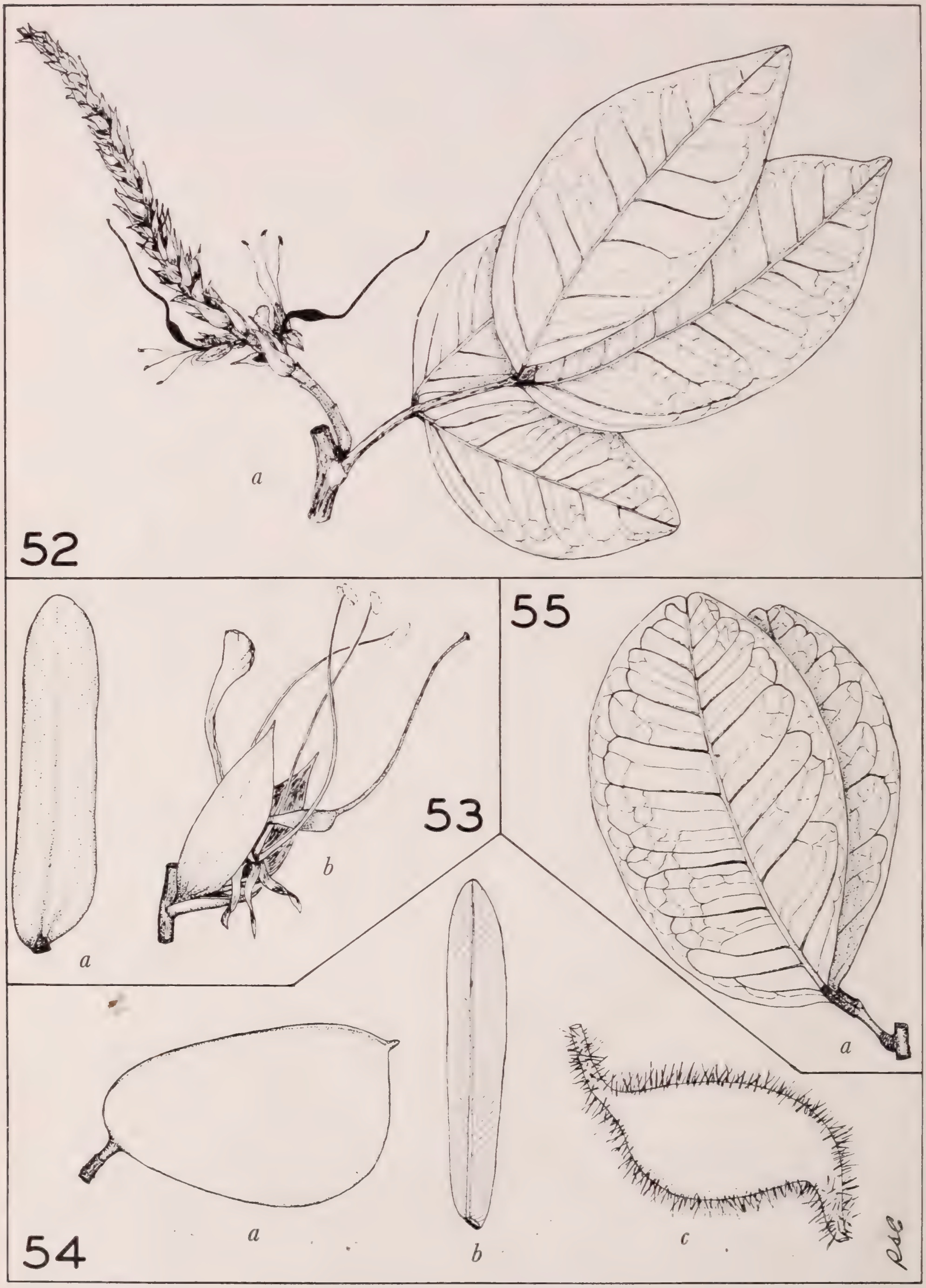


FIG. 52. *Macrolobium spectabile* (*Wurdack & Adderley 43508*). a, habit, × 0.5. FIG. 53. *Macrolobium evenulosum* (*Wurdack & Adderley 42941*). a, leaflet, × 2; b, open flower, × 2. FIG. 54. *Macrolobium cataractarum* (*Maguire & Maguire 35025*). a, fruit, × 1; b, leaflet, × 2; c, portion of gynoecium, × 30. FIG. 55. *Macrolobium acrothamnos* (*Cardona 2176*). a, leaf, × 0.5.

This collection, from the type locality, is the first since the original collection.

21′. Macrolobium spectabile Cowan, sp. nov. Fig. 52.

Arbor dumosa 4–7 m alta, ramulis cano-puberulis, stipulis caducis non visis. Petioli cylindrici apicem versus canaliculati, 18–25 mm longi, puberuli, rhachibus cylindricis sed canaliculatis, puberulis, 28–32 mm longis; foliola glabra, bijugata, petiolulis 1.5–3 mm longis, laminis subcarnosis, discoloratis, conspicue venosis, 8–11.5 cm longis, 4.5–5.5 cm latis, late ellipticis, ad basim inaequilateraliter acutis, ad apicem obtusis, costa venisque plus minusve elevatis in faciebus ambobus. Inflorescentiae axillares, 12–23 cm longae, axe cano-velutino, bracteis perconspicuis, persistentibus, cano-velutinis, 14–17 mm longis, 4–7 mm latis, acuminatis, ovato-lanceolatis ad lanceolatas, pedicello 3.5–4.5 mm longo, cano-puberulo, bracteolis persistentibus, acuminatis, anguste ellipticis, 8–10 mm longis, 3.5–4 mm latis. Hypanthium 2 mm longum, glabrum. Sepala 4, maxima ex parte glabra sed ad apicem ciliolata, oblonga, obtusa ad acuta, 4–4.5 mm longa, 1.5–2.5 mm lata; petalum album, oblanceolatum, 13–15 mm longum, 6.5–7.5 mm latum, extus glabrum (ad basim puberulum), intus villosum. Staminum filamenta rubra, leviter villosa, 19 mm longa, antheris ellipticis, 1.2 mm longis. Stigma punctiforme, stylo filiformi, leviter villoso, 17 mm longo, ovario glabro basim versus marginaliter puberulo excepto, 4 mm longo, 1.5 mm lato, anguste oblongo, gynophoro 4 mm longo, puberulo. Fructus ignotus.

VENEZUELA: Amazonas: frequent on lower slopes of granitic *laja* on right bank of Río Siapa, 8 km below Raudal Gallineta (about 100 river km from mouth), alt. 130–200 m; bushy tree 4–7 m; petal white, filaments red; 20 Jul 1959, *J. J. Wurdack & L. S. Adderley 43508* (holotype, US No. 2281741).

The relationship of this truly spectacular species is with *M. campestre* and *M. arenarium*, species of the eastern end of the Amazon Basin. It is nearest the typical variety of *M. campestre* from which it differs in petiole length, sepal number, size of the petal, size and vestiture of the bracts, etc. It is so completely different from other species of the genus in Venezuela that on first examination one might not recognize its affinities.

23′. Macrolobium acrothamnos Cowan, sp. nov. Fig. 55.

Arbuscula 8 m alta, ramulis glabris, petiolo 12–14 mm longo, glabro, foliolis unijugatis. Petioluli 3–5 mm longi, glabri; laminae late ellipticae, 7–11 cm longae, 4.5–7 cm latae, glabrae, inaequilateraliter acutae ad basim, ad apicem rotundae emarginataeque, haud attenuatae apicem versus, costa plana sed venulis leviter salientibus supra, infra costa et venulis conspicue salientibus. Inflorescentiae 4–10 cm longae, axillares, glabrae, pedunculo 7–21 mm longo, bracteis caducis, triangularibus, acutis, 1.5 mm longis latisque, pedicello 3–5 mm longo, glabro, bracteolis persistentibus, crasso-carnosis, 0.8 mm crassis, glabris, obovato-oblongis, rotundis ad apicem, 7 mm longis, 4.5 mm latis. Hypanthium 2.5 mm longum, glabrum, stipite 1 mm longo, glabro, sepala 4, oblongo-ovata vel oblonga, 4.5–5 mm longa, 2.5–3.5 mm lata, obtusa, glabra; petali stipes 1.5 mm longus, ad basim leviter pilosulus, lamina 5 mm longa, 6 mm lata, suboblata, ad basim villosa intus, extus glabra. Filamenta 7.5–9.5 mm longa, villosa, ad basim breviter connata, antheris 2.5 mm longis, 1 mm latis, oblongis, glabris. Gynoecium glabrum, stylo 7.5 mm longo, ovario elliptico, ca. 2 mm longo, 1 mm lato. Fructus maturus 9 cm longus, ca. 3.5 cm latus, oblongus, ad marginem dorsualem anguste alatus, semina 2.5 cm diametro, lateraliter compressa.

VENEZUELA: Bolívar: cumbre del Cerro Arepuchi, 600 m, Caroní, Guayana; Sep 1947, *F. Cardona 2176* (holotype, US No. 1932164); same locality and collector, Mai 1945, *1136.*

M. acrothamnos, the epithet chosen to emphasize the unusual habitat of the species atop one of the sandstone, tabletop mountains in Guayana (ἄκρον: ''summit,'' θάμνος: ''shrub''), is most nearly related to *M. canaliculatum* but differs in a rather large number of details. The present collections of the new species are almost glabrous in both vegetative and fertile parts, the leaflets are relatively wider, and the flowers are smaller.

2′. **Macrolobium cataractarum** Cowan, sp. nov. Fig. 54.

Arbor fruticosa 3–10 m alta, ramulis pilosulis sed mox glabrescentibus, stipulis linearibus, 6 mm longis, caducis. Petiolum 2–5 mm longum, glabrum, rhachibus 30–37 mm longis, anguste rigido-alatis, glabris, foliolis 8–10-jugatis, glabris, (17–)25–30 mm longis, 2.5–3.5 mm latis, linearibus, ad apicem obtusis et mucronatis, leviter venulosis. Inflorescentiae terminales, 4–4.5 cm longae, axe leviter minuto-puberulo, bracteis caducis, pedicello ca. 0.5–1 mm longo, micropuberulo, bracteolis 5.5 mm longis, 2.5 mm latis, ellipticis, acuminatis, minute pilosulosis intus, extus micropuberulis. Hypanthium cupulare, 1.5 mm longum, glabrum; sepala 5, lanceolata, acuminata, 2–3 mm longa, 0.7–1.5 mm lata, glabra; petali stipes 4 mm longus, ad basim ciliolatus et sparse pilosulus, lamina suborbiculari, ca. 5 mm diametro, glabra. Staminum filamenta glabra, 14 mm longa. Stigma capitellatum, stylo ca. 12 mm longo; ovarium 1.5 mm longum, 0.7 mm latum, ellipticum, marginaliter pilosulum, lateraliter glabrum, gynophoro ca. 0.5 mm longo, pilosulo. Fructus obovatus, compressus, glaber, 37 mm longus, 23 mm latus, stipite 5 mm longo, minute et sparse pilosulo.

VENEZUELA: Amazonas: frequent among rocks and boulders near Salto Coro-Coro, Río Manapiare, alt. 150 m; shrubby tree 3–10 m high; fls pink; 28 Jan 1953, *Bassett Maguire & Celia K. Maguire 35025* (holotype, US No. 2281670).

M. cataractarum (the epithet alludes to the habitat of the plant) is certainly a near relative of *M. gracile*, especially to var. *confertum* of that species. The two taxa differ in shape and number of pairs of leaflets, pedicel length, pubescence type on the gynoecium, and size of the fruit.

10′. **Macrolobium evenulosum** Cowan, sp. nov. Fig. 53.

Arbuscula 2–4 m alta, ramulis puberulis, stipulis caducis, triangularibus, 2 mm longis, 1 mm latis, acutis, ciliolatis, puberulis extus, intus glabris. Petioli 9–10 mm longi, puberuli, rachibus 9–10.5 cm longis, anguste rigido-alatis, leviter puberulis; laminae anguste oblongae, foliolis 14–19-jugatis, sessilibus, rigidis, 18–22 mm longis, 4–5.5 mm latis, anguste oblongis, ad basim inaequilateraliter obtusis, ad apicem rotundis, glabris supra, infra minute cano-strigulosis, costa venulisque obscuris. Inflorescentiae 4.5–5.5 cm longae, sessiles, axe puberulo, bracteis persistentibus, 5.5–7 mm longis, ca. 3.5 mm latis, elliptico-lanceolatis, acutis ad acuminatas, pilosulis extus, intus glabris, pedicello 2 mm longo, puberulo, bracteolis persistentibus, 12–13 mm longis, ca. 5 mm latis, lanceolatis, acuminatis, pilosis intus, extus pilosulis. Hypanthium 2.5 mm longum, glabrum; sepala 5 (duobus adaxilibus prope omnino connatis), 6–7 mm longa, 2.5–3 mm lata, oblonga, acuta, glabra extus, intus sparse pilosa, ad apicem ciliata; petali stipes 8–9 mm longus, extus glaber, intus villosus, lamina obovata, attenuata basim versus, 6 mm longa, 4.5 mm lata, glabra. Staminorum filamenta 21 mm longa, ad basim puberula. Stigma minute capitellatum, stylo 16 mm longo, glabro; ovarium oblongum, 4 mm longum, 1.5 mm latum, marginaliter sparse puberulum, gynophoro 2.5 mm longo, puberulo. Fructus ignotus.

VENEZUELA: Amazonas: frequent along Río Atabapo between mouth of Caño Temi and Manacal, alt. 125 m; shrub 2–4 m; bracts and filaments red, petal white; 11 Jun 1959, *J. J. Wurdack & L. S. Adderley 42941* (holotype, US No. 2281708).

M. evenulosum differs from both its near relatives, *M. venulosum* and *M. flexuosum*, in several respects: (1) Its leaflets are differently shaped and lack any obvious venation (hence the specific epithet), although the position of the costa is apparent by a slight depression on the upper surface of the leaflets; (2) the bracts and bracteoles are several times longer; and (3) the petal differs in the size and shape of its parts. In sepal number the new species approaches more nearly *M. flexuosum*, in which species the adaxial pair are free from each other or only slightly united basally.

24. **Macrolobium punctatum** Spruce ex Benth.

VENEZUELA: Amazonas: Sabana Jivoa, right bank of Río Orinoco about 30 km above mouth of Río Atabapo (opposite Minicio), alt. 125 m, 1 Aug 1959, *Wurdack & Adderley 43721.*

This is the first record of this species in Venezuela, although it is known by collections from northwestern Brazil and in Colombia on the Río Guainía.

33a. **Macrolobium suaveolens** Spruce ex Benth. var. **pakarimense** Cowan.

VENEZUELA: Amazonas: *Clusia*-scrub forest on lower slopes of Cerro de la Neblina, alt. 700 m; 14–16 Nov 1957 and 31 Dec 1957, *Maguire, Wurdack & Maguire 42074, 42560.*

These collections represent the first report of this species in Venezuela and a considerable extension of range for this British Guiana variety. The new material differs in having nearly glabrous bracteoles, whereas those of the original collections were definitely puberulous.

38. **Macrolobium stenopetalum** Amshoff.

Wurdack & Adderley 42849 (unicate), from near San Fernando de Atabapo, is fruiting but it matches very well the material of this species, except that the fruit is shorter than in the original description. Since it has been known previously only from Tafelberg in Suriname, this Venezuelan collection represents a considerable extension of range and a new record for Venezuela.

Sclerolobium dwyeri Cowan, sp. nov. Fig. 58.

Arbor 10–20 m alta, ramulis minute puberulis vel strigulosis, stipulis 12 mm longis, pinnatis, segmentis lineari-subulatis. Petiolus 3.5–5 cm longus, apicem versus valde 7–9 mm diametro inflatus, minute strigulosus, rhachi 8.5–12 cm longa, minute strigulosa, foliolis 5-jugatis, petiolulis 4.5–5.5 mm longis, teretibus, minuto-strigulosis. Laminae inaequilaterales, (paribus inferioribus minoribus, ovatis, 6.5–7.5 cm longis, 3–4 cm latis), aliis 8.5–13 cm longis, 4–5.5 cm latis, ovato-ellipticis ad ellipticas, ad basim rotundatis ad leviter cordatas, ad apicem acuminatis vel breviter acuminatis, parce strigulosis et glabrescentibus in faciebus ambobus (costa strigulosa excepta), costa et venis primariis venulisque conspicue

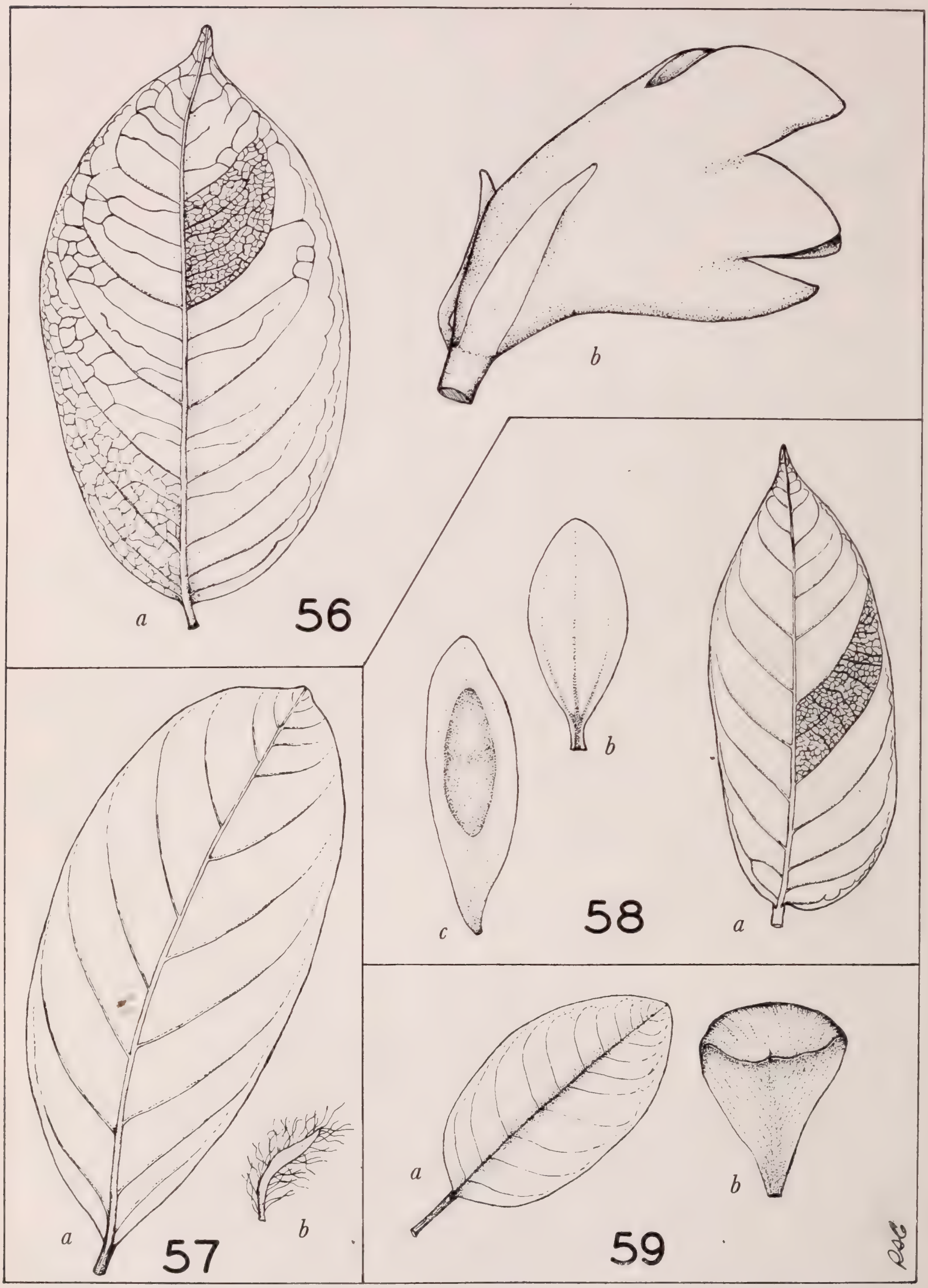


Fig. 56. *Pterocarpus grandis* (*Maguire et al. 41944*). a, one leaflet, × 0.5; b, calyx with bracteoles, × ca. 7.5 Fig. 57. *Sclerolobium pimichinensis* (*Maguire et al. 41830*). a, one leaflet, × 0.5; b, one petal, × ca. 7.5. Fig. 58. *Sclerolobium dwyeri* (*Maguire et al. 41831*). a, one leaflet, × 0.5; b, one petal, × 10; c, one fruit, × 1 (*Williams 14734*). Fig. 59. *Aldina petiolulata* (*Maguire et al. 42555*). a, one leaflet, × 0.5; b, petal, × 2.

plus minusve salientibus. Inflorescentiae 15–25 cm longae, axillares et terminales, paniculatae, ramulis racemiformibus, axe minute striguloso, pedunculo 0–10.5 cm longo, bracteis et bracteolis caducis, bracteolis anguste lanceolatis, acutis, 1.5–2 mm longis, externe minuto-strigulosis, pedicello 2–3 mm longo, sericeo. Hypanthium ca. 1 mm profundo, campanulatum, externe sericeum. Sepala cucullata, 2 mm longa, ovalia, ciliata, sericea. Petala lutea, elliptica, cuneata, 2.5–3 mm longa, obtusa, ad basim sericea. Filamenta 3.5–4.5 mm longa, aureo-pilosa. Ovarium hispido-pilosum, pubibus suberectis, aureis, stylo glabro, ca. 1.2 mm longo. Fructus glaber, oblongo-ellipticus, 35–45 mm longus, 12 mm latus.

VENEZUELA: Amazonas: occasional along Caño Pimichín below Pimichín, alt. 120–140 m; tree 12–15 m; fls bright yellow; ''canache''; 10 Oct 1957, *Bassett Maguire, John J. Wurdack & William M. Keith 41831* (holotype, US No. 2267418); locally frequent at edges of sabanita on right bank of Río Pacimoni 12 km below mouth of Río Yatua, alt. 100–140 m; tree 10–20 m; fls bright yellow; 2 Oct 1957, *Maguire, Wurdack & Maguire 41652*: en la selva alta, frondosa de tierra firme, Solano, Bajo Casiquiare, alt. 100 m; arbol de tamaño mediano (18 m), con copa abierta de forma irregular; tronco 25 cm de diam, algo redondo, no derecho, libre de ramas por las ¾ partes de la altura; corteza morenisca, algo fissurada y el liber colorado obscuro; la albura es de color claro, y el duramen más obscuro; ''N.V.: Canasti (Baré)''; 11 Mar 1942, *L. Williams 14734*.

The pectinate stipules are similar to those of *S. guianensis* but *S. dwyeri* has much shorter bracteoles and pedicels, obovate rather than linear petals, and leaflets with prominent secondary-tertiary vein-reticulum. The new species is named for John D. Dwyer, the most recent student of this group, in recognition of his contributions to the knowledge of tropical American Leguminosae.

Sclerolobium pimichinensis Cowan, sp. nov. Fig. 57.

Arbor 15–30 m alta, ramulis dense minuto-strigulosis, stipulis caducis. Petiolus 4.5–5 cm longus, dense minuto-strigulosus, teres, rhachi 12–13 cm longa, minuto-strigulosa, tereti, foliolis 4-jugatis, petiolulis 6–9 mm longis, dense minuto-strigulosis, laminis 10.5–17 cm longis, 5.5–8.5 cm latis, ovalibus ad ellipticas, ad basim acutis ad subobtusas, ad apicem rotundis, puberulis ad costam supra, infra aureo-sericeis, costa salienti, 5–7 venis primariis planis supra, infra salientibus. Inflorescentiae paniculato-racemosae, ad 20 cm longae, axe dense minuto-striguloso, pedunculo 38–60 mm longo, bracteis caducis, subulato-linearibus, 4.5 mm longis, dense minuto-strigulosis, pedicello 1.3–1.5 mm longo, minuto-striguloso. Hypanthium campanulatum, ca. 1.5 mm profundo, dense minuto-strigulosum, calycis segmentis 2 mm longis, 1.5–1.8 mm latis, rotundis, dense strigulosis extus, intus parce villoso-sericeis, petalis 2 mm longis, 0.2 mm latis, linearibus, villosis. Filamenta 2.5–3.5 mm longa, dense aureo-villosa. Ovarium 1.5 mm longum, anguste ellipticum, rufo-strigosum, stylo glabro, 0.8 mm longo. Fructus ignotus.

VENEZUELA: Amazonas: occasional along Caño Pimichín, below Pimichín, Río Guainía, alt. 120–140 m; tree 15–30 m; fls pale yellow; 10 Oct 1957, *Bassett Maguire, John J. Wurdack & William M. Keith 41830* (holotype, US No. 2267417).

In Dwyer's treatment of this genus (Lloydia **20**:67. 1957.) this collection should key-out near *S. eriopetalum*, to which it bears considerable resemblance. The latter has the leaflets acuminate and the base obtusely inequilateral; its petals are larger, and its bracts are often persistent.

LEGUMINOSAE—LOTOIDEAE

Cyclolobium amazonicum Ducke.

VENEZUELA: Amazonas: along Río Orinoco just below mouth of Caño Yapacana, alt. 125 m; tree 6 m; petals deep maroon; 30 Jul 1959, *Wurdack & Adderley 43675.*

This is the first collection reported from Venezuela of a species better known in the upper Rio Negro drainage of adjacent Brazil.

Dalbergia riedelii (Radlk.) Sandw.

VENEZUELA: Amazonas: frequent along Río Casiquiare just above Capihuara, alt. 130 m; woody vine climbing 3–7 m; fls white; 24 Jun 1959, *Wurdack & Adderley 43164;* along Río Casiquiare just above Piedra Guanare, alt. 110 m; woody vine climbing 3 m; fls white, 25 Jun 1959, *Wurdack & Adderley 43180.*

This predominantly British Guiana species is also known from the State of Pará in Brazil, from the southeastern corner of Colombia, and from the upper Rio Negro in Brazil; the present collections are the first to be reported from the adjacent region in Venezuela.

Diplotropis racemosa (Hoehne) Amshoff.

VENEZUELA: Amazonas: occasional along Río Casiquiare just above Piedra Guanare, alt. 110 m; bushy tree 10 m; fls white, pink-flushed; 25 Jun 1959, *Wurdack & Adderley 43181.*

The range of the typical form of this species, with this first report from Venezuela, extends from north-central Matto Grosso (the type locality), to the mouth of the Amazon River, to the upper Rio Negro drainage and the southwestern extremity of Venezuela.

Lonchocarpus paniculatus Ducke.

VENEZUELA: Amazonas: forest edge at San Fernando de Atabapo, alt. 125 m; tree 30 m tall, 1 m DBH; fls purple; 6 Jun 1959, *Wurdack & Adderley 42843.*

COLOMBIA: along left bank of Río Orinoco just below mouth of Río Atabapo, alt. 125 m; tree 8 m; fruit green; 6 Aug 1959, *Wurdack & Adderley 43775.*

These collections represent the first report of this species in Venezuela; in both, the leaflets and fruits are a little larger than typical, but in most respects this material is very near *L. paniculatus.* The inflorescence and infrutescence are unnaturally congested as a result of disease on the living plant.

Machaerium floribundum Benth.

VENEZUELA: Amazonas: along river between Cerro Yapacana and Santa Barbara, alt. 125 m; woody vine climbing 8 mm in trees, inner bark with abundant dark red exudate; corolla white, the banner apically with red-purple blotch; 17 Jan 1958, *Maguire, Wurdack & Keith 42652.*

This is the first report of this wide-ranging species in Venezuela; it has also been collected in eastern Colombia, British Guiana, and northern Brazil.

Pterocarpus grandis Cowan, sp. nov. Fig. 56.

Arbor parva, strigulosa sed mox glabrescens, stipulis caducis, lanceolatis, 6 mm longis, 3 mm latis. Folia 5–6-foliolata, petiolo 7 cm longo, sparse striguloso, tereti, rhachi plus minusve tereti, sparse strigulosa, 8.5–10 cm longa, foliolis alternis, petiolulis 6–9 mm longis, sparse puberulis supra profunde canaliculatis, laminis 14–20 cm longis, 8–10.5 cm latis, foliorum ad basim illis lato-ovatis,

aliis late ellipticis, ovalibus vel ovato-ellipticis, ad basim laminis rotundis truncatisque vel solum rotundis, ad apicem abrupte obtuso-acuminatis, valde salienti-venosis, plus minusve coriaceis. Inflorescentiae axillares, paniculatae, 8.5–21 cm longae, pedunculo 2–4 cm longo, axe striguloso, bracteis bracteolisque sublinearibus, 3–4 mm longis, ca. 0.5 mm latis, strigulosis extus, intus glabris, pedicello 3–3.5 mm longo, striguloso. Calycis tubus campanulatus, ca. 5 mm longus, dense strigulosus, lobis acutis, 2–2.5 mm latis, triangularibus vel triangulari-oblongis, dense strigulosis. Corolla glabra, obscuro-aurantiaca, vexillo reflexo, unguiculo 4 mm longo, lamina oblata, 8 mm longa, 10 mm lata, ad apicem emarginata, alis oblongo-obovatis, unguiculo 3 mm longo, laminis 10 mm longis, 5 mm latis, obtusis, petalis carinalibus apicem versus cohaerentibus, unguiculo 4.5 mm longo, lamina ad basim unilateraliter auriculata, falcato-obovata, obtusa, 9 mm longa, 5 mm lata. Stamina glabra, filamentis 6 mm connatis, 10–12 mm longis. Ovarium lanceolatum, sessile, dense sericeum, 3.5 mm longum, 1.5 mm latum, stylo 10 mm longo, parte basilari sericeo. Fructus 1–2-seminatus, brevivelutinus, obovatus vel suborbicularis, 6–8 cm longus, 5.5–6.5 cm latus, valde venosus.

VENEZUELA: Amazonas: along uppermost Río Yatua, alt. 100–140 m; low tree; fls dull orange, the keel [banner] with a basal purple-brown spot; 25–26 Oct 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 41944* (holotype, US No. 2267428); same locality, 7–8 Dec 1953, *Maguire, Wurdack & Bunting 36731.*

The resemblance between this species and *P. rohrii* is obvious, but they are easily distinguished by the size of the leaflets, bracts, and bracteoles; the pubescence of the inflorescence and flower parts is also of a different type in the two species.

ANNOUNCEMENT

Beginning 1 January 1960, all back issues of Memoirs of the New York Botanical Garden will be handled exclusively by Stechert-Hafner, 31 East 10th Street, New York 3, N. Y. Current issues will be handled as heretofore by the Garden. Claims for missing issues should be directed to the Garden.

Stechert-Hafner will perform the same service for back issues of all serials published by The New York Botanical Garden and will reprint parts that have become exhausted. Prices of parts and volumes may be had on application to Stechert-Hafner.

NEW YORK
FEB 18 1964

MEMOIRS

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME 10, NUMBER 5

The Botany of the Guayana Highland—Part V
BASSETT MAGUIRE AND JOHN J. WURDACK AND COLLABORATORS 1

Taxonomy of the Subgenus Pterodes, Genus Luzula.....JOHN E. EBINGER 279

Lists and Keys of the Cedar Rusts of the World...........FRANK D. KERN 305

Issued 17 February 1964

The Memoirs of The New York Botanical Garden are issued at irregular intervals in parts of various sizes. Approximately 500 pages will complete a volume. The subscription prize of volume 10 is $10.00. This issue, Number 5, of volume 10, completes the volume. Number 5 may be purchased separately for $4.50.

Authors of papers may obtain separate copies of their contributions, printed at the same time as the issue, at cost price.

Volume 11 will be devoted entirely to the Manual of the Leafy Hepaticae of Latin America by Margaret H. Fulford. The subscription price for the volume is $10.00. Part I was published in 1963 and can be purchased separately for $5.00.

For further information address the editor:

Clark T. Rogerson
The New York Botanical Garden
Bronx Park
Bronx, New York 10458

MEMOIRS

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME 10

1. **The Botany of the Guayana Highland—Part III**
Bassett Maguire and John J. Wurdack and Collaborators 1

Anatomy of Guayana Mutisieae. Part II.......... *Sherwin Carlquist* 157

2. **The Botany of the Guayana Highland—Part IV**
Bassett Maguire and John J. Wurdack and Collaborators 1

The Morphology and Relationships of Diomma, Gen. Inc. Sed.
William L. Stern and George K. Brizicky 38

Taxonomic Relationships of Diomma Engler ex Harms
Richard S. Cowan and George K. Brizicky 58

Anatomy of Guayana Xyridaceae: Abolboda, Orectanthe, and Achlyphila....................................... *Sherwin Carlquist* 65

3. **A Revision of Spathiphyllum (Araceae)**........... *George S. Bunting* 1

4. **The Botany of the Guayana Highland—Part IV (2)**
Bassett Maguire and John J. Wurdack and Collaborators 1

5. **The Botany of the Guayana Highland—Part V**
Bassett Maguire and John J. Wurdack and Collaborators 1

Taxonomy of the Subgenus Pterodes, Genus Luzula. . *John E. Ebinger* 279

Lists and Keys of the Cedar Rusts of the World....... *Frank D. Kern* 305

Volume 10

Dates of Issue

Number 1	1 Jul 1958
Number 2	30 Apr 1960
Number 3	30 Nov [Dec] 1960
Number 4	15 Mar 1961-
Number 5	17 February 1964

FEB 1964 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN **10**(5):1–278

THE BOTANY OF THE GUAYANA HIGHLAND—PART V

BASSETT MAGUIRE AND JOHN J. WURDACK
AND COLLABORATORS

INTRODUCTION

Since the preparation of Part IV of these reports on the botany of the sandstone regions of Guayana (southern Venezuela and contiguous British Guiana and Brazil, and Amazonian Colombia), the following additional trips of exploration [1] have been made:

1. Middle and upper Río Orinoco, Río Atabapo, Río Casiquiare, Río Guainia, Río Pacimoni and Río Siapa, in Amazonas, Venezuela; John J. Wurdack and Lincoln Adderley, 15 May 1959–8 August 1959; Nos. 42656–43798.
2. Merumé Mountains (Río Partang), Mt. Ayanganna, and the Kukui, Kako, Kamarang Rivers, all affluents of the upper Mazaruni River, Pakaraima Mountains, British Guiana, 8 June 1960–2 November 1960; Bassett Maguire, Stephen S. Tillett, Celia K. Maguire, Carolyn L. Tillett, Rufus Boyan; Nos. 43799–43999; 44814–45268.

Bassett and Celia Maguire returned to Georgetown, B. G. on June 29, leaving Stephen and Carolyn Tillett and Rufus Boyan to carry out the larger part of the expedition. Boyan withdrew from the field party on August 26.

Collections from the Merumé Mountains and Mt. Ayanganna were most rewarding. These trips of reconnaissance indicate that the two mountain areas should become the object of full-scale botanical exploration.

3. Drainages of the Ireng and Kopinang (Potaro River affluent) rivers, Southern Pakaraima Mountains, British Guiana, 21 August 1961–25 September 1961; Bassett Maguire, Celia K. Maguire, G. Wilson-Browne, S.J.; Nos. 45923–46264.

We present in Part V of "The Botany of the Guayana Highland" contributions as follows: *Bambusoideae* by F. A. McClure; *Xyridaceae* by Bassett Maguire and Lyman B. Smith; *Bromeliaceae* by Lyman B. Smith; *Piperaceae* by T. G. Yuncker; *Lauraceae* by Caroline K. Allen, of which the genus *Persea* is by Lucille Kopp; *Moronoboideae, Guttiferae* by Bassett Maguire; *Melastomataceae* by John J. Wurdack; and *Rubiaceae* by Julian A. Steyermark.

It may be assumed that cited specimens collected on the Guayana expeditions are deposited at The New York Botanical Garden, the National Herbarium of Venezuela, and the U. S. National Herbarium.

BAMBUSOIDEAE [2]

The following bamboos were among the plants collected in Guayanan Venezuela, on recent expeditions of The New York Botanical Garden.

---

[1] The National Science Foundation has, in large part, financed the three expeditions described above, and the study of materials herein reported.

[2] By F. A. McClure, Research Associate, Department of Botany, Smithsonian Institution; studies of the Bambusoideae, aided by funds from the National Science Foundation.

Arthrostylidium schomburgkii (Bennett) Munro.

Arundinaria schomburgkii Bennett in R. H. Schomburgk, Trans. Linn. Soc. **18**: 562. 1841.

Weak-stemmed clump bamboo; mature culms 40–50 feet long, first internode commonly 10–15 feet long, usually 5–8 culms per clump; locally abundant in cloud forest on upper talus, northeast face of Cerro Marahuaca, alt. 1500–1800 m., 3 May 1949, Amazonas, Venezuela, *Bassett Maguire & Bassett Maguire, Jr. 29162.*

It appears, from the records at present available (Jour. N. Y. Bot. Gard. **50**: 164. 1949), that the Maguires were the first to collect flowering material of this interesting bamboo since the discovery and collection of the plant by Robert H. Schomburgk on his last expedition to Guiana, 120 years ago.

The formal Latin description by which Bennett (l. c.) established the name of the plant is extremely short, but it is preceded by a very full enumeration of technical characteristics recorded by Schomburgk (Trans. Linn. Soc. **18**: 559, 560. 1841) which served, in part at least, as the basis of the Latin diagnosis with which Munro (Trans. Linn. Soc. **26**: 41, 42. 1868) accompanied his transfer of the specific name of the plant from *Arundinaria* to *Arthrostylidium*. The following details in Schomburgk's account, omitted from Munro's treatment, are deemed worthy of repetition here: "The Maiongcong and Guinau Indians, whom the Spaniards called Maquiritares, conducted us to that part of Marawacca (a high mountain which terminates in an almost perpendicular wall of sandstone) where the plant grows. It is a day's journey from a Maiongcong settlement on the river Cuyaca, from whence the hospitable and good-natured savages showed us the beaten track. After having ascended Mount Marawacca, to about 3500 feet above the Indian village, the traveller follows a small mountain-stream, on the banks of which the *Curas* or *Curatas*, as the Indians call these reeds, grow in dense tufts. They form generally clusters of from fifty to one hundred,[3] which are pushed forth, as in many other species of that tribe, by a strong, jointed subterranean rootstock."

The disproportionate elongation of the first internode of the culms, generally assumed to be peculiar to this bamboo, occurs also in a number of other species of this and other Western Hemisphere bamboo genera. Another notable feature of this plant, shown by both the herbarium specimens and examples of the blowguns brought back by the Maguires, is the occurrence, immediately above the long first internode, of two nodes without an intervening internode, the consecutive sheath scars being only about 10 mm distant from each other. The formation of culm sheaths and of branch complements at such congested nodes is distichous, and normal in other respects as well. The congestion of nodes (suppression of internodes) in conjunction with elongated internodes occurs also in a number of other species of diverse bamboo genera of the Western Hemisphere, but apparently it has not hitherto been referred to in published accounts pertaining to this group of plants.

---

[3] Collector's note: This passage quoted from Schomburgk's writings casts some doubt that the report is from first-hand observation. Rather the remarks suggest (as does a water-color sketch on deposit at the British Museum) that Schomburgk actually did not see *Arthrostylidium* [*Arundinaria*] *schomburgkii* growing, but that he wrote from hearsay evidence. Actually, this interesting bamboo grows as a weak undercover plant, requiring the support of upper story trees, on precipitous talus at the base of the Marahuaca escarpment (alt. 5500 feet), exhibiting a striking habit in a most restricted and restrictive habitat. Seldom do clumps, even in largest plants, comprise as many as ten culms. Most frequently the number of stems is from five to eight. B. M.

Arthrostylidium cacuminis McClure, sp. nov.

Culmi humiles, vix 60-centimetrales et 2 mm diametro (vel pro parte basali tantum 2 cm longa suppetente 3 mm diametro) omnino glabri, internodiis inanibus usque ad 45 mm longis cylindratis, nodis supra cicatricem mediocrem inflatis: culmi vaginae desideratae; rami (in specimine) solitarii omnino glabri, nonnullis ad basim bulbosis, vaginis desideratis: foliorum vaginae paucae vel plures (usque ad 12) supra medium nervoso-striatae carinataeque, in dorsum marginesque glabrae, ad apicem utrinque productae, auriculis obsoletis, setis oralibus nullis vel paucissimis, usque ad 2 mm longis, pallidis, glabris, ligula interior 2–3 mm longa, ad apicem truncata vel paululum rotundata, ad marginem integra vel minute erosa, in dorsum glabra, ligula exterior lineola, ad marginem integra, in dorsum glabra: foliorum laminae usque ad 16 cm longae et usque ad 2 cm latae, lanceolatae vel oblongo-lanceolatae, in apicem acutum attenuatae, basi in petiolum fuscum glabrumque rotundatae, dempta pagina inferiore minute papillosae paginis utrisque marginibusque omnino glabrae, costa subtus tantum basin versus invalide manifesta, nervis secundariis tertiariisque invalidis, venulis transversis non manifestis.

Inflorescentia vel axillaris vel ramos foliiferos terminans, subspicato-racemosa, pedunculo vix exserto, rhachi usque ad 27.5 cm longa, gracili, omnino glabra, tereti, supra insertionem pedicellorum sulcata, bracteis pedicellos subtendentibus obsoletis, pedicellis 5–25 mm distantibus, millimetralibus, semicylindratis, adpressis, apice bicarinatis, omnino glabris: spiculae adpressae, juveniles teretes, arctae, usque ad 20 mm longae, 3–4-florae, maturitate compressiusculae mox diffractae, floscula suprema ad lemma sterilem valide involutum subsetiforme reducta, rachillae segmentis compresso-clavatis, apice subito paululum dilatatis, omnino glabris nitidisque, inferioribus infra medium superioribus supra medium paleae attingentibus, infra lemma et supra glumam vacuam superiorem disarticulantibus, glumis vacuis vulgo 2, approximatis, pallide stramineis, papyraceis, submembranaceis, fragilibus, subaequalibus 5–6 mm longis, extrinsecus omnino glabris, intus apicem versus albo-strigosis, dorso carinatis, apice submucronatis: lemma usque ad 9 mm longum, viridi-stramineum, paulum indurate papyraceum, fragile, apicem versus obtusum carinatum, alibi nervibus plerisque submersis plurinerve, dorso marginibusque glabrum intus apicem versus minute et antrorse albo-strigosum; palea lemma aequans vel plus minusve valde superans, papyracea, marginibus hyalina, apice obtusa, sulco glabra vel sursum leviter hispidula, extra carinas glabra invalide paucinerviisque, carinis glabra vel subglabra; lodiculae nullae; antherae non inventae; ovarium fuscum glabrum; stylus solitarius apice divisus in stigmatibus 2 brevibus invalide ramosis vel hyalinis. Fructus maturus desideratus.

Type. Occasional in dense elfin forest, vicinity of Summit Camp, alt. 1500 m, Cerro Huachamacari, Río Cunucunuma, 15 Dec 1950, Amazonas, Venezuela, *Bassett Maguire, R. S. Cowan & John J. Wurdack 30249* (holotype US, isotype NY).

In superficial floral characters this species closely resembles *A. scandens* McClure, from which it differs in the almost complete glabrousness of the vegetative and reproductive parts (at least those present in the type specimen), in the flared apex of the rachilla-segments, in the absence of lodicules, in the shape of the apex of the leaf-sheath, in the weaker development of the oral setae of the leaf-sheath, and in the narrower leaf-blades. The absence of lodicules is correlated with an absence of evidence that the florets open at anthesis, and with the hyaline form of the stigma in an occasional floret.

Arthrostylidium scandens McClure, sp. nov.

Culmi ''scandentes, usque ad 8-metrales,'' internodiis . . . nodis . . . vaginis (omnibus desideratis); rami (partes incompletae tantum ramulas ferentes suppetunt) elongati, graciles, semel ramosi, internodiis glabris nitidisque; foliorum vaginae crassae, supra medium nervoso-striatae carinataeque, glabrae vel glabrescentes, auriculis subobsoletis, setis oralibus crebris, crassis, pallidis, glabris vel asperulis, usque ad 10 mm longis, apice gracillimis fragilisque demum diffractis, ligula interior brevissima vulgo non exserta, ligula exterior glabra, nitida, apice emarginata vel undulans, margine integra vel minutissime ciliolata; foliorum laminae usque ad 18 cm longae et usque ad 35 mm latae, lanceolatae vel oblongo-lanceolatae, apicem versus obtusulum subito acuminatae basi in petiolum crassum usque ad 8 mm longum omnino glabrum inaequaliter rotundatae, paginis utrisque dempto apice hispidulo glabrae, costa subtus tantum basin versus manifesta, nervis secundariis tertiariis vix distinguendis, venulis transversis non manifestis.

Inflorescentia vel axillaris vel ramos foliiferos terminans subspicato-racemosa, pedunculo vix exserto, rhachi usque ad 30 cm longa gracili, omnino glabra, passim papillulosa, tereti, supra insertionem pedicellorum sulcata, bracteis pedicellos subtendentibus minutis vel obsoletis, pedicellis rarissime approximatis vulgo 2–3 cm sese distantibus, plerisque ca. 0.5 mm longis nonnullis brevioribus, semicylindratis adpressis, bicarinatis, carinis ciliolatis alibi glabris; spiculae antrorsae, juveniles teretes arctaeque, maturitate compressiusculae hiantesque, mox diffractae pleraeque 5-flores, floscula suprema ad lemma sterile valide involutum subsetiforme reducta; rachillae segmentis compresso-clavatis omnino glabris nitidisque, inferioribus, non medium paleae attingentibus, superioribus medium paleae excedentibus, infra lemmata et supra glumam superiorem disarticulantibus, glumis vacuis vulgo 2, approximatis persistentibus, lanceolatis, hispidulis vel subglabris, pallide stramineis, papyraceis, fragilibus, subaequalibus 5–6 mm longis, carinatis, apice mucronatis; lemma 7–10 mm (rarissime 13 mm) longum, viridi-stramineum purpura pictum, paulum indurate papyraceum fragile (fissile), apicem versus acutum submucronatum carinatumque alibi nervibus submersis plurinerve, dorso omnino glabrum vel superne hispidulum, intus apicem versus minute albo-strigosum; palea lemma aequans vel superans, membranacea, apice comoso obtusa, sulco hispidula, extra carinas glabra invalide paucinervisque, carinis setosula vel glabra; lodiculae 3, hyalinae, enerves, apice parce ciliolatae alibi glabrae, ca. 2 mm longae, diversiformes, anteriores spathulatae, inaequaliter ovato-lanceolatae apice subobtusae, posterior lanceolata; antherae 5.5–6 mm longae primo reticulato-virides brunneo pictae demum pallide brunneae, basi hastatae utrinque apiculatae; apice cornibus 2 brevibus approximatis angustatae, connectivo supra haud producto; ovarium pallidum glabrum; stylus albidus glaber solitarius, supra divisus in stigmatibus 2 dendriformibus, ramis longis gracillimis iterum ramosis. Fructus maturus desideratus.

Type. Locally frequent along stream in moist forest, alt. 600–800 m, below Camp II, Cerro Huachamacari, Río Cunucunuma, 20 Dec 1950, Amazonas, Venezuela, *Bassett Maguire, R. S. Cowan & John J. Wurdack 29957* (holotype US, isotype NY).

The habit of the plant and the nature of the stigmas place this species near *A. excelsum* Grisebach, which differs most obviously in the inferior length and diameter and the zigzag habit of the inflorescence axis, the more delicate leaf-sheaths and the narrower leaf-blades.

Merostachys maguireorum McClure, sp. nov.

Culmi ''usque ad 12-metrales,'' internodiis (mediani fragmenta sola cum nodo ramifero suppetunt) inanibus, hornotinis farinosis, ''infimis 1.2–1.5 metralibus,'' nodis cicatrice modice prominentibus retrorse sericeo-barbatis; culmi vaginae desideratae; rami numerosi, graciles, subaequales, basi tantum divisi (ramiferi), internodiis papillosis, infimis retrorse tomentosis superioribus glabris, nodis retrorse barbatulis vel strigosulis, vaginis persistentibus, infimis pubescentibus apice aristatis, superioribus quam internodiis brevioribus, retrorse pubescentibus laminiferis, lamina mox abscissili; foliorum vaginae arctae, minute striatae, dense et minute papillosae, auriculis obsoletis, setis oralibus paucis, invalidis, pallidis, glabris, usque ad 2 mm longis, ligula interior vix 0.5 mm exserta, fragili, fusca, apice truncata vel arcuata undulataque, margine fere integra, dorso aspera, ligula exterior brevissima, emarginata, margine obscure erosa; foliorum laminae lanceolatae, apice attenuatae, basi in petiolum gracilem subglabrum usque ad 4 mm longum rotundatae, paginis utrisque glabrae vel subglabrae passim minute papillosae, marginibus spinulosae; costa supra subtusque vix manifesta, venulis transversis pagina inferiore distantibus parum insignibus, pagina superiore non manifestis.

Inflorescentia (racemus secundus) ramos foliiferos terminans, pedunculo glabro 2–4 cm exserto, rhachi gracili, curvulata tortulosaque, 4–8 cm longa angulato-sulcata, omnino antrorse puberula, bracteis pedicellos subtendentibus dempta infima mediocri obsoletis vel minutis, pedicellis 3–8 mm distantibus, ca. 1 mm longis, pilis densis albidis sericeisque antrorse adpressis vestitis; spiculae antrorsae, pleraeque 15–16 mm longae, fusiformes, uniflores, infimae supremaeque 1–3 interdum depauperatae, rachillae segmento (dempta superiore setiformi) vix 1 mm longo; glumae vacuae approximatae, membranaceo-papyraceae, subglabrae, valde inaequales, I: basi semiamplexicaulis, lanceolata valde carinata, 3-nerviis, apice acuminata in aristam filiformem fragilissimam attenuata, 5–6 mm longa (dempta arista 1 mm longa), II: basi amplexicaulis, oblongo-lanceolata, invalide carinata, plurinervis, nervibus valde prominentibus, apice in mucronem brevem acuminata, 10–12 mm longa, dorso minutissime papillosa; lemma papyraceum, 13–14 mm longum, oblongo-lanceolatum apice in mucronem brevem acuminatum, dorso carinatum, invalide plurinerve, dorso passim pilis albidis adpresso-pubescentulum, praecipue apicem versus minute papillosum albo-strigosumque, intus apicem versus minute albo-strigosum; palea lemma aequans, dempto apice indurato rigido papyracea supra involuta, basi hians, dorso invalide plurinervia, apice albo-comato bicarinata cornibus asperis bicornataque, extus praecipue apicem versus papillis antrorse uncinatis dense obsita, dorso profunde sulcata, sulco (dempta parte mediana subtubuliformi) sursum deorsumque aperto, basi glabro apice pubescenti; lodiculae 3, omnino glabrae, ca. 3 mm longae, membranaceae, margine hyalinae, diversiformes, anteriores semiovatae vel semiovato-lanceolatae, posteriore lanceolata; antherae apice bicornes, cornibus diverse curvis, connectivo haud producto; ovarium fuscum glabrum; styli elongati glabri; stigmata fimbrillis raris sparsa. Fructus maturus desideratus.

Type. Clumped bamboo of some 10–15 stems, culms ca. 40 feet long, lower internodes 4–5 feet long, infrequent, rain forest, Upper Río Cunucunuma, alt. 200 m, May 1949, Amazonas, Venezuela, *Bassett Maguire & Bassett Maguire, Jr. 29163* (holotype US, isotype NY).

Merostachys retrorsa McClure, sp. nov.

Culmi debiles ''vix erecti, usque ad 2.5 metrales,'' internodiis (infimum tantum suppetit) inanis, dempta zona angusta albo-strigosa infra nodos (infimos saltem) glabris, nodis cicatrice tantum modice prominentibus, culmi vaginis desideratis; rami aliquantum (saltem in specimine) inaequales, basi tantum divisi, internodiis elongatis, antrorse vel retrorse tomentosis demum glabrescentibus, rami vaginis desideratis; foliorum vaginae arctae, dorso papillosae, secus marginem externam albo-tomentosae alibi glabrae vel scabrae vel pro parte hispidulae, inferiores vix striatae supremae striatae, auriculis obsoletis, setis oralibus crebris, pallidis, asperis, usque ad 10 mm longis, apice gracillimis fragilibus demum detritis, ligula interior brevissima vulgo non exserta, ligula exterior glabra, nitida, apice concava, margine integra vel minutissime ciliolata; foliorum laminae usque ad 20 cm longae et usque ad 38 mm latae, lanceolatae vel ovato-lanceolatae vel oblongo-lanceolatae, apicem versus obtusulum acuminatum angustatae, basi in petiolum ca. 4 mm longum marginibus ciliolatum alibi glabrum haud pulvinatum paullatim rotundatae, pagina superiore prope marginem externam antrorse asperae, alibi paginis utrisque glabrae et papillulosae, marginibus spinulosae; costa invalide manifesta, venulis transversis distantibus pagina inferiore mediocriter insignibus, pagina superiore non manifestis.

Inflorescentia (racemus secundus) ramos foliiferos vel vaginiferos terminans, pedunculo 6–17 cm exserto gracili, dempta parte superiore pubescenti glabro, passim papilluloso, rhachi usque ad 8 cm longa, albo-villosa, tereti, supra insertionem pedicellorum sulcata, bracteis pedicellos subtendentibus minutis vel obsoletis, pedicellis 2–10 mm sese distantibus, usque ad 2 mm longis, albo-sericeis; spiculae retrorsae, uniflorae, pleraeque 16–17 mm longae fusiformes, infima supremaeque 1–5 immaturae, rachillae segmento (dempta superiore setiformi) tereti vix 1 mm longo, albo-sericeo; glumae vacuae paene 1 mm sese distantes rigido-papyraceae, carinatae, marginibus albo-ciliolatae, I: basi semiamplexicaulis, 5–7 mm longa, paene enerviis, apice apiculata, dorso puberula, II: basi amplexicaulis, 8–9 mm longa (dempta aristula 1 mm longa), invalide 5-nervis, dorso glabra; lemma 13–14 mm longum, induratum, glabrum, nitidum, obscurinerve, prope tantum apicem mucronatum comosum invalide carinatum; palea lemma aequans, valide indurata, inflata, dempto sulco semitubuliformi prope apicem villosa, alibi glabra enervis, apice bicornis, cornibus adpresse albohispidis; lodiculae 3, hyalinae, invalide nervosae, apice pauciciliolatae alibi glabrae, diversiformes inaequalesque, anteriores ca. 4 mm longae, semiovatolanceolatae, posteriore ca. 3 mm longa, lanceolata; antherae apice bicornutae, connectivo haud producto; ovarium glabrum fuscum; styli elongati glabri; stigmata lanciformia omnino nigro-villosa. Fructus maturus desideratus.

Type. On portage trail along Río Tirica (Río Aparuren) just above Techinemeru, alt. 470 m, Chimantá Massif, 16 Jan 1955, Bolívar, Venezuela, *J. A. Steyermark & John J. Wurdack 117* (holotype US, isotype NY).

In general appearance, especially in the retrorse orientation of the spikelets, this species resembles *M. pauciflora* (as *pauciflorus*) Swallen, which differs most conspicuously in the distinctly smaller dimensions of the leaf blades and all external parts of the inflorescence, in the closer approximation of the second glume to the lemma in length, the prominent exsertion of the palea beyond the tip of the lemma, and the soft, not indurate, texture of both lemma and palea.

XYRIDALES [4]

In the natural order Xyridales there has in the past been presented a review of the Guayana representatives as follows: *Orectanthe,*[5] *Abolboda,*[5] and *Achlyphila* [6] of the Xyridaceae, and with the exception of *Rapatea* and *Stegolepis* but including *Maschalocephalus* of Africa, the sixteen genera of the Rapateaceae.[7] There are now presented herewith supplementary notes on *Abolboda* and our treatment of Guayana *Xyris.* There yet remains a detailed consideration of the two rapateaceous genera, *Rapatea* and *Stegolepis,* to complete the survey of Guayana Xyridales.

XYRIDACEAE

Abolboda Kunth in Humboldt & Bonpland, Pl. Aequin. **2**: 25. 1809.

Abolboda minima Maguire, sp. nov.

A. killipii Lasser affinis sed spicis unifloris et foliis laevibus.

Herbae tenuiter perennes, acaulescentes; foliis numerosis, rosulatis subteretibus laevibus, 2–12 mm longi, 0.4–0.5 mm diam., minutissimis serrulatis (ad 20 mag.), abrupte truncatis, unilateraliter mucronatis, basi expansa scariosa amplectanti; scapis nullis; spica uniflora; bracteis paucis lanciacuminatis, scariosis, planis, ca. 5 mm longis, 1-nervis; sepalis 2, conduplicatis, lanceolatis, pungenter acuminatis, scariosis, dorsaliter firmis, 7–9 mm longis; corollis albidis essentialiter regularibus 12–13 mm longis, tubo hypocrateriformi ca. 8.5 mm longo, lobis orbiculari-obovatis, retusis, 4–5 mm longis; staminodiis evidenter nullis; staminibus 3; filamentis planis, 1-nervatis, ad tubum adnatis, supra 0.6–0.8 mm liberis; antheris oblongo-sagittatis, 1.0–1.2 mm longis, granis pollinis sphaeroideis, non aperturatis, spinosis, 110–120 μ diam., sporodermate ca. 10 μ crassa; stylo ca. 8 mm longo, appendicibus 2; stigmate hypocrateriformi fimbriato; ovario ovali; seminibus non visis.

Type. Flowers very pale blue, fading white, locally abundant in Sabana Manacal, 15 km above Guarinumo, alt. 125–140 m, Río Atabapo, 12 Jun 1959, Amazonas, Venezuela, *J. J. Wurdack & L. S. Adderley 42977* (holotype NY). Paratype. Flowers pale blue, locally occasional in Sabana El Venado on left bank of Caño Pimichín above Pimichín, alt. 140 m, Río Guainía, 2 Jul 1959, Amazonas, Venezuela, *J. J. Wurdack & L. S. Adderley 43296.*

Distribution. Known only from the type region.

Abolboda minima is clearly allied to *A. killipii* and *A. acaulis,* both of which have well-developed spicules, each with several flowers subtended by relatively broad, falcate, firm sepals. In leaf-form our new plant is most like *A. killipii,* but it lacks the foliar ornamentation of that species.

Abolboda ebracteata Maguire & Wurdack, Mem. N. Y. Bot. Gard. **10**: 17. 1958.

Abolboda ebracteata var. **ebracteata.**

A small scapose herb with cephalar bracts long-productate and exceeding the florets; and long (6–12 cm), linear, convolute leaves. Known only from the Yapacana Savannas on the Alto Orinoco.

---

[4] By Bassett Maguire and Lyman B. Smith.

[5] Mem. N. Y. Bot. Gard. 10^1: 1–19. 1958.

[6] Mem. N. Y. Bot. Gard. 10^2: 12–14. 1960.

[7] Mem. N. Y. Bot. Gard. 10^1: 19–49. 1958.

Abolboda ebracteata var. **brevifolia** Maguire, var. nov.

Folio vulgo 3.0–4.5 cm longa, ca. 1.5 mm lata, basibus vaginatis, valde 7–9-nervatis, marginibus conspicue scariosis; scapo ebracteato, bracteis basilaribus exceptis; bracteis cephalaribus 6–8 mm longis et spica bracteis breviori; spicis et floribus ut in var. *ebracteata.*

Type. Flowers purple-blue, locally abundant in Sabana de Moyo, right hand bank of Río Orinoco, 10 km above mouth of Río Ventuari, alt. 125 m, 31 Jul 1959, Amazonas, Venezuela, *J. J. Wurdack & L. S. Adderley 43689* (holotype NY). Paratype. Flowers purple-blue, apparently rare, Cacagual Savanna, alt. 135 m, Río Atabapo, 13 Sep 1957, Vaupés, Colombia, *Maguire, Wurdack & Keith 41439.*

The two populations, treated as varieties here, are quite distinct, and in their respective localities quite uniform. Should they be found to retain this distinction while occurring in the same locality, it perhaps would then be better to consider them to be distinct species.

Xyris Linnaeus, Sp. Pl. 42. 1753.

Of the three generally recognized sections of *Xyris,* the smallest, sect. *Pomatoxyris,* confined to Australia and probably of no more than 20 species, is characterized by a basally 3-locular capsule.

The sect. *Xyris,* consisting perhaps of a hundred or more species, is characterized by a unilocular capsule and parietal placentation and is predominantly North American and pantropic. In South American Guayana we find only three species of the euxyrids: *X. caroliniana,* which is highly variable, plastic, and widespread; *X. fallax,* often confused with the above, well represented in Guayana, in coastal Guiana, and south to Mato Grosso in Brazil; *X. erythema,* endemic to Guayana and known at this time only from the Pakaraima Mountains, British Guiana.

It is the sect. *Nematopus,* with unilocular capsules and basal placentation, that provides the great majority of the neotropical taxa, possibly exceeding 160 species. A brief consideration of the distribution and geographic implications of these species is instructive. For convenience of reference we have placed in tabular form, under four categories (high-altitude Guayana endemic species, low-altitude Guayana endemic species, species of Guayana-Brasilia distribution, and widespread species) the names of the 72 species of *Xyris* now known to occur in Guayana. In view of the world and particularly the widespread Western Hemisphere distribution of the genus, the degree of endemism achieved in Guayana is most remarkable. Of the 72 Guayana species, 60 or approximately 85 per cent are endemic.

As now recorded 34 species (one, *X. erythema* belonging to the sect. *Xyris,* 33 to the sect. *Nematopus*) are restricted to the higher (above 600 m) areas of the Roraima sandstone sediments. A somewhat smaller grouping of 26 (all belonging to the sect. *Nematopus*), invariably occurring on sandy, usually moist, soil of savannas or sandbanks, is found at lower altitudes below 500 meters. Of these, *X. involucrata* often occurs in savannas up to 1200 meters altitude, and has, not surprisingly, been collected on similar habitats along the lower Rio Negro; *X. uleana,* while also predominantly of lower altitudes, has a similar geographic distribution.

Six species, all of low altitude except *X. hymenachne* (which in Guayana is scantily collected, and is confined to high altitude), have a common Guayana-

TABLE 1. Altitudinal and Geographical Distribution of Guayana *Xyris*.
Section *Nematopus*, 69 Species; Section *Xyris*, 3 Species.

HIGH ALTITUDE ENDEMICS

X. erythema M. & S.
X. thysanolepis M. & S.
X. concinna N. E. Br.
X. submontana Gl.
X. sipapoa M. & S.
X. stenophylloides Malme
X. atriceps Malme
X. decussata Gl.
X. witsenioides Oliver
X. riparia M. & S.
X. ptariana Steyerm.
X. xiphophylla M. & S.
X. bicephala Gl.
X. roraimae Malme
X. albescens Steyerm.
X. setigera Oliver
X. culmenicola Steyerm.
X. tatei Malme
X. lugubris Malme
X. scabridula Steyerm.
X. delicatula M. & S.
X. juncifolia M. & S.
X. neblinae M. & S.
X. lanulobractea Steyerm.
X. cyperoides Gl.
X. rugulosa M. & S.
X. bicostata M. & S.
X. steyermarkii M. & S.
X. connosepala Lanj.
X. duidensis Malme
X. contracta M. & S.
X. frondosa M. & S.
X. pratensis M. & S.
X. yutajensis M. & S.

LOW ALTITUDE ENDEMICS

X. involucrata Nees
X. spruceana Malme
X. cryptantha M. & S.
X. uleana Malme
X. esmeraldae Steyerm.
X. exserta I. & S.
X. fusiformis M. & S.
X. oxylepis I. & S.
X. garcia-barrigae I. & S.
X. wurdackii M. & S.
X. aquatica I. & S.
X. terrestris I. & S.
X. stenostachya Steyerm.
X. arachnoidea M. & S.
X. globosa Alb. Nilss.
X. yapobodensis I. & S.
X. filiscapa Malme
X. subuniflora Malme
X. rubrolimbata Hiemerl
X. applanata I. & S.
X. frequens M. & S.
X. teinosperma I. & S.
X. araracuarae M. & S.
X. carinata M. & S.
X. cuatrecasana I. & S.
X. subglabrata Malme

GUAYANA-BRASILIA

X. seubertii Alb. Nilss.
X. hymenachne Mart.
X. lomatophylla Mart.
X. guianensis Steud.
X. lacerata Pohl ex Seub.
X. paraensis Poepp.

WIDESPREAD OR OTHER

X. caroliniana Walt.
X. fallax Malme
X. longiceps Malme
X. surinamensis Spreng.
X. malmeana L. B. Smith
X. savanensis Miq.

Brazilian Highland distribution. Of these, *X. lomatophylla* is rather broadly distributed in lowland Guayana, but is more sparingly found southward.

And finally six species (four of the sect. *Nematopus*, and two of the sect. *Xyris*) have a more general distribution in Guayana, coastal Guiana, Amazonia, and Brasilia. All these reach middle altitudes on the Roraima sediments.

In the Brazilian Highland and contiguous areas there is a second great center of distribution in which some 80 to 90 species are to be found. There is here also represented a high degree of restricted and broader endemism, and a residue of species of general and widespread distribution.

The two areas, then, that of Guayana to the north of the Amazon, and Brasilia to the south, are in many respects analogous, namely as to history, physiography, and phyletic composition of the xyrid population. Very few identical species as indicated above occur in both areas, but many instances of close intraspecific relationships obtain.

It is suggested that *Xyris* in South America, with its present bicentric distribution, may have occupied at one time an essentially identical and continuous area, and that in subsequent history, by the intervention of the Amazon Basin, the original area became divided, and that since then a parallel evolution has proceeded without appreciable interchange.

Type species: *Xyris indica* Linnaeus.

Key to the Sections of *Xyris*

1. Placentae parietal; funicles short. I. Section *Xyris.*
1. Placenta basal; funicles mostly elongate. II. Section *Nematopus.*

I. Section Xyris.

Key to the Species of Section *Xyris*

1. Dorsal area uniform or with a very obscure median line; scapes 1–2-costate; seeds broadly ellipsoid, biapiculate with 2 minute black appendages. 1. *X. caroliniana.*
1. Dorsal area with a strong median line; scapes 2–9-costate; seeds irregularly cylindric or fusiform with a single large pale appendage.
    2. Rhizomes lacking; leaves even or finely nerved, 1–5 mm wide. 2. *X. fallax.*
    2. Rhizomes present; leaves coarsely and laxly nerved, 8 mm wide. 3. *X. erythema.*

1. **Xyris caroliniana** Walter, Flora Carol. 69. 1788.

The commonest and most widespread, and most variable and plastic species of *Xyris* in the Western Hemisphere. Two ill-defined varieties may be recognized.

Xyris caroliniana Walter var. **caroliniana.**

X. jupicai L. C. Richard, Act. Soc. Hist. Nat. Paris **1**: 106. 1792.
X. communis Kunth, Enum. Pl. **4**: 12. 1843.
X. surinamensis Miquel, Linnaea **17**: 58. 1843. non Sprengel, 1828.
X. difformis Chapman, Fl. So. U. S. 500. 1860.
X. elata Chapman, Fl. So. U. S. 501. 1860.

Type. ''Carolina,'' *Walter.*

Distribution. Southeastern United States, Central America, the West Indies, and South America to central Argentina and Uruguay; common.

Xyris caroliniana Walter var. **major** (Martius) Idrobo & Smith, Caldasia **6**: 199. *f. 4.* 1954.

X. macrocephala Vahl, Enum. Pl. 2: 204. 1805.
X. laxifolia Martius, Flora **24**^{2} (Beibl. 2): 58. 1841.
X. laxifolia α *major* Martius, Flora **24**^{2} (Beibl. 2): 58. 1841.
X. sellowiana Kunth, Enum. Pl. **4**: 13. 1843.

Type. Brazil, *Martius Hb. Fl. Bras. 547* (M, F photo 18669).

Distribution. Central America and the West Indies to central Argentina and Uruguay; common.

Plants of var. *major,* as the name suggests, are merely qualitatively large ecologic or genetic expressions of the species, in which the leaves and scapes are longer and coarser, and the spikes conspicuously larger, reaching 35 mm in length and 20 mm in diameter. No satisfactory ''break'' point can be reached in separating the two varieties.

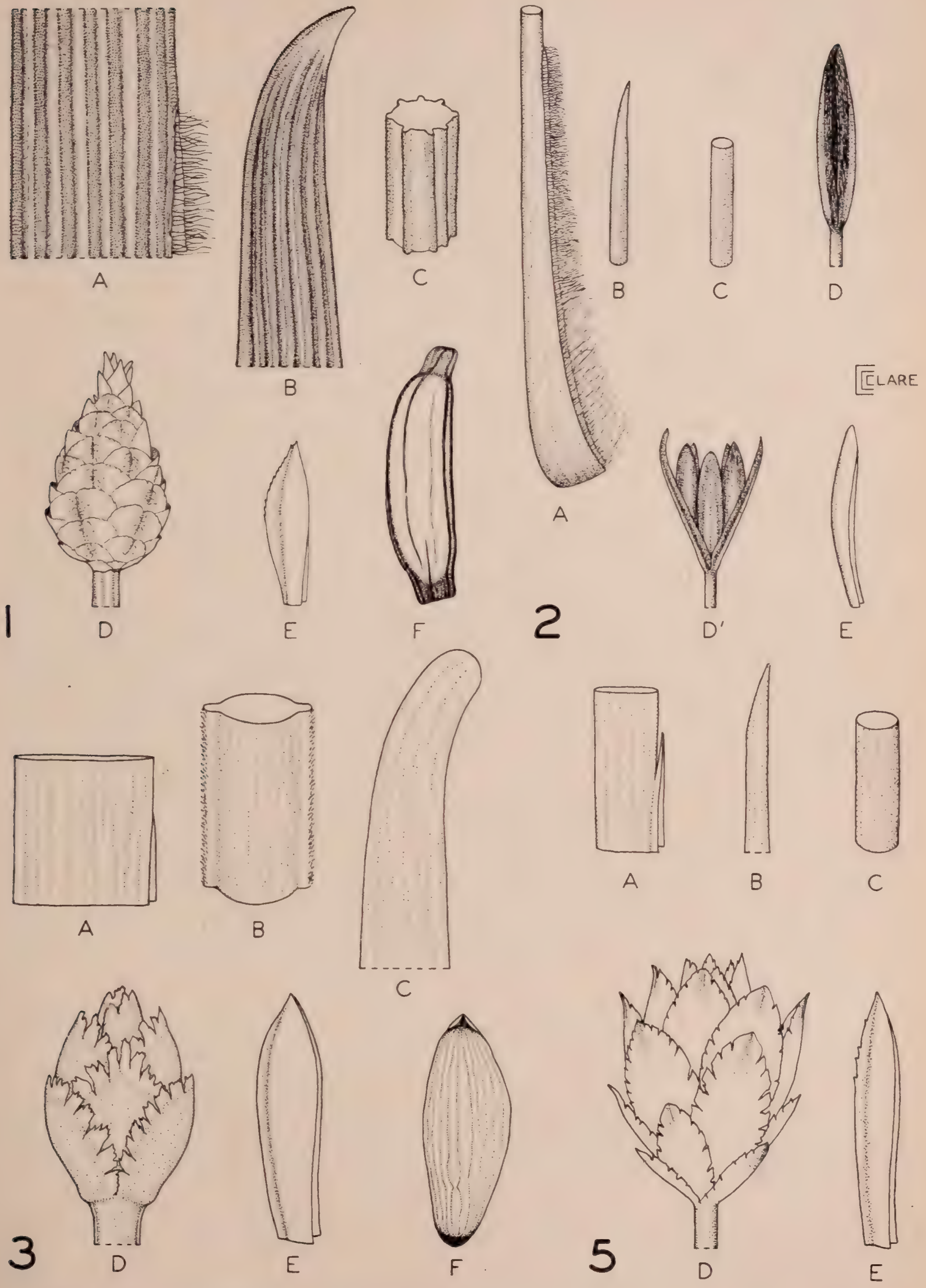


FIG. 1. *Xyris erythema.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2. E, sepal, × 5. F, seed, × 20. FIG. 2. *Xyris cryptantha.* A, sheath, × 5. B, blade apex, × 5. C, blade section, × 5. D, spike closed, × 3. D′, spike open, × 3. E, sepal, × 5. FIG. 3. *Xyris thysanolepis.* A, sheath apex, × 5. B, scape section, × 10. C, blade apex, × 10. D, spike, × 3. E, sepal, × 5. F, seed, × 40. FIG. 5. *Xyris riparia.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 3. E, sepal, × 5.

2. **Xyris fallax** Malme, Bihang Sv. Vet.-akad. Handl. **22**, Afd. 3, No. 2: 12. *pl. 1, f. 5.* 1896.

> *X. dolichosperma* Lanjouw, Rec. Trav. Bot. Néerl. **34**: 488. *f. 5.* 1937. Type. In savannis humidis prope Zanderij I, Suriname, *Pulle 39* (U).

Type. Santa Anna da Chapada, Mato Grosso, Brazil, *G. Malme 1432* (S).

Distribution. Common in savanna areas, eastern Colombia, Venezuela, British Guiana and Suriname, and south to Mato Grosso, Brazil. Especially frequent in Guayana to altitudes up to 1500 m, and often in the field confused with *X. caroliniana* but readily distinguished from that species by its multicostate scapes, and nerved dorsal area.

3. **Xyris erythema** Maguire & Smith, sp. nov. Fig. 1, A–F.

Herbae acaules perennes, rhizomatibus horizontalibus, 4 mm diam.; foliis equitantibus, lateraliter valde compressis, 20–42 cm longis, crasse laxeque nervatis, praesertim ad nervos transverse rugulosis, plus minusve roseo-suffusis, basin versus rubro-brunneis; vaginis ad 14 cm longis, basin versus gradatim ampliatis, apice eligulatis et in laminas confluentibus, intus dense brunneo-ciliatis; laminis linearibus, falcato-acutis, 8 mm latis; scapo erecto, rigido, 25–68 cm alto, multicostato, praesertim ad costas tuberculato; spica ovoidea, 12–15 mm longa, multiflora; bracteis infimis valde reductis, bracteis fertilibus obovatis, late rotundatis, sepala superantibus, brunneis, glabris, integris, area dorsali bene distincta, subelliptica, viridi-grisea, linea mediana praedita; sepalis lateralibus liberis, lanceolatis, acutis, 4.5 mm longis, subaequilateralibus, carina lata, apicem versus irregulariter serrulata; staminodiis penicillatis; placentis parietalibus; seminibus immaturis solum cognitis, paucis, fusiformibus, apice albo-appendiculatis.

Type. Leaves stiff, reddish-brown toward base, brittle, flowers yellow, infrequent in wet places, scrub and low forest (8–10 m), on shoulder of east flank, above Thompson Camp, alt. 1418–1525 m, 10 Aug 1960, Upper Mazaruni River Basin, Mt. Ayanganna, British Guiana, *S. S. & C. L. Tillett & R. Boyan 45074* (holotype NY, isotype US). Paratypes. British Guiana, Merumé Mts., Partang River: along ridge trail, alt. 1140 m, infrequent in marshy areas in forest, 3 Jul 1960, *Tillett & Boyan 43974;* frequent on sand and rocks of stream bed, *Tillett & Boyan 43998.*

This species is closely related to *Xyris fallax* Malme, as evidenced by its multicostate scapes and by the practically identical form of the seeds. However, it is strikingly differentiated by the presence of rhizomes and coarsely and laxly nerved rugulose leaves that are often suffused with a brilliant red hue.

Distribution. Known only from the Merumé and Ayanganna uplands of the Pakaraima Mountains, British Guiana, apparently there to the exclusion of its close relative *X. fallax.*

II. **Section Nematopus** Seubert in Martius, Fl. Bras. 3¹: 211. 1855.

Key to the Species of Section *Nematopus*

1. Basal bract (at least one) or bracts elongate, usually exceeding those immediately above.
    2. Basal bracts foliaceous; scape bialate.
        3. Leaves much shorter than the scape, 4–6 mm wide; basal sterile bracts numerous, spreading to reflexed. 4. *X. involucrata.*

3. Leaves only slightly shorter than the scape, 2.5 mm wide; basal sterile bracts few, suberect. 5. *X. spruceana.*

2. Basal bracts not foliaceous; scape bialate to terete and ecostate.

4. Spike 1–2-flowered; sterile bracts 9 or 10; basal pair of bracts ecarinate, not cuspidate, exceeding the remainder of the spike; sepals 5.5 mm long. 6. *X. cryptantha.*

4. Spike several–many-flowered; sterile bracts few.

5. Scapes 5–15 cm high; lateral sepals 3–3.3 mm long, finely ciliate. 7. *X. uleana.*

5. Scapes 25–50 cm high; lateral sepals 7 mm long; tufted at the apex. 8. *X. seubertii.*

1. Basal bracts short, equaling or more often distinctly shorter than those immediately above.

6. Dorsal area of the bract lacking or obscure.

7. Margin of the bract contrasting with the remainder, membranaceous, lacerate.

8. Bract-margin red, spreading. 9. *X. thysanolepis.*

8. Bract-margin hyaline or white, erect.

9. Bases of the leaf-sheaths dull, not much dilated; blades mostly well over 1 mm wide. 10. *X. hymenachne.*

9. Bases of the leaf-sheaths lustrous brown, abruptly orbicular.

10. Leaf-blades slightly over 1 mm wide; bracts acute. 11. *X. concinna.*

10. Leaf-blades 2–3 mm wide; bracts broadly rounded.

11. Margins of leaf-blades glabrous; spikes depressed-subglobose; flower-bracts granulate. 12. *X. submontana.*

11. Margins of leaf-blades dusty white-ciliate; spikes oblong-subglobose; flower-bracts smooth. 13. *X. sipapoa.*

7. Margin of the bract not greatly distinguished from the remainder in texture or color.

12. Leaf-sheaths abruptly wider than the terete blades.

13. Leaves flat, smooth; sheaths yellow-brown; bracts initially glabrous. 14. *X. stenophylloides.*

13. Leaves terete, somewhat rugulose toward the base; sheaths dark castaneous to nearly black; bracts scantily lanulose or ciliate at the apex, glabrate. 15. *X. atriceps.*

12. Leaf-sheaths merging gradually with the blades.

14. Plants long-caulescent; leaves densely imbricate and forming broad frond-like plates.

15. Scape ancipital; scapes and leaves ciliate; leaf-blades obliquely obtuse; bracts decussate, stem simple. 16. *X. decussata.*

15. Scape terete or subterete; scapes glabrous; leaf-blades glabrous.

16. Leaf-blade to 2 mm wide, not contracted at the base, the apex straight; sheaths wholly or almost wholly brown.

17. Sheaths glabrous, sharply carinate; leaves 7–13 cm long; blades green, contrasting sharply with the sheaths. 17. *X. witsenioides.*

17. Sheaths ciliate, rounded on the back; leaves to 24 cm long; blades dark, not contrasting with the sheaths. 18. *X. riparia.*

16. Leaf-blade 3–9 mm wide, contracted at the base; sheaths green except the extreme base.

18. Sepals 6.5–7 mm long; leaf-blades 6 mm wide. 19. *X. ptariana.*

18. Sepals 12 mm long; leaf-blades 9 mm wide. 20. *X. xiphophylla.*

14. Plants short-caulescent; leaves not forming distinct plates.

19. Inflorescence of 2 sessile spikes. 21. *X. bicephala.*

19. Inflorescence always simple.

20. Leaf-blades prominently ciliate.

21. Scape ciliate on the costae, ancipital.

22. Spike ovoid, 7–8 mm in diameter; bracts spirally arranged. 22. *X. roraimae.*

22. Spike globose, 12–17 mm in diameter; bracts more or less decussate. 23. *X. albescens.*

21. Scape glabrous.

23. Leaf-apex straight, abruptly subulate-tipped. 24. *X. setigera.*

23. Leaf-apex more or less falcate, acute, not appendaged. 25. *X. culmenicola.*

20. Leaf-blades glabrous or rugulose.
24. Inflorescence 1-flowered; leaves 1–6 cm long, twisted. 26. *X. esmeraldae.*
24. Inflorescence few–many-flowered.
25. Scape bicostate, ancipital. 27. *X. tatei.*
25. Scape ecostate, terete to somewhat flattened.
26. Leaf-blades 2.5–3.5 mm wide; spike obovoid, 11–13 (–15) mm long, many-flowered. 28. *X. lugubris.*
26. Leaf-blades 0.5–1.5 mm wide.
27. Blades flat, even. 29. *X. scabridula.*
27. Blades terete, rugulose. 30. *X. delicatula.*
6. Dorsal area of the bract clearly evident.
28. Leaf-blade terete.
29. Spike 1–3-flowered, slenderly fusiform becoming obconic with age.
30. Leaf-blade 0.2 mm in diameter, abruptly contracted from the glabrous sheath. 31. *X. exserta.*
30. Leaf-blade 1 mm in diameter, merging with the ciliate sheath. 32. *X. fusiformis.*
29. Spike few–many-flowered; leaf-blade 0.2–2.4 mm in diameter.
31. Leaf-sheaths ciliate.
32. Bracts glabrous, acute; leaves smooth. 33. *X. oxylepis.*
32. Bracts lanate, at least at the apex.
33. Leaves scabrous; margins of the obtuse bracts clearly visible. 34. *X. garcia-barrigae.*
33. Leaves smooth or irregularly sulcate when dry; margins of the acute bracts obscured by the copious white indument. 35. *X. wurdackii.*
31. Leaf-sheaths glabrous.
34. Plant aquatic; rhizomes elongate; leaves flaccid; sheaths with an auricle 2 mm long; sepals equilateral. 36. *X. aquatica.*
34. Plant terrestrial; rhizomes short; leaves subrigid.
35. Auricle of the sheath 8 mm long; sepals inequilateral. 37. *X. terrestris.*
35. Auricle of the sheath 1 mm long or less.
36. Sheaths pale; sepals strongly inequilateral. 38. *X. juncifolia.*
36. Sheaths dark castaneous; sepals equilateral. 39. *X. neblinae.*
28. Leaf-blade linear, distinctly flattened.
37. Spikes long and slender, much more than twice as long as broad.
38. Bracts more than 2-ranked. 40. *X. longiceps.*
38. Bracts 2-ranked. 41. *X. stenostachya.*
37. Spikes stout or short, mostly less than twice as long as broad.
39. Bracts vestite, at least toward the apex.
40. Bracts acute. 42. *X. arachnoidea.*
40. Bracts broadly rounded.
41. Leaf-blades 2–5 mm wide, strongly thickened on the margins; spike subglobose to cylindric, 10–35 mm long. 43. *X. lomatophylla.*
41. Leaf-blades 1 mm wide, not thickened on the margins; spike globose to ovoid or obovoid.
42. Sheaths abruptly orbicular-dilated and castaneous at the extreme base, elsewhere green. 44. *X. globosa.*
42. Sheaths not dilated at the base, wholly dark-castaneous. 45. *X. lanulobractea.*
39. Bracts merely ciliate or completely glabrous.
43. Spikes 1–3-flowered, slenderly fusiform, spreading to obconic with age; bracts eciliate, the basal ones mostly about half as long as the spike.
44. Lateral sepals free.
45. Bracts obtuse; leaf-sheaths glabrous. 46. *X. yapobodensis.*
45. Bracts acute.
46. Leaf-sheaths glabrous.
47. Blades 0.3–0.4 mm wide, not marginally thickened. 47. *X. cyperoides.*
47. Blades 1–2 mm wide, marginally thickened.
48. Leaves transversely rugulose. 48. *X. rugulosa.*
48. Leaves even or sulcate, not rugulose. 49. *X. guianensis.*

46. Leaf-sheaths ciliate.
49. Scapes bicostate, ciliate on the costae; basal bracts much less than half the length of the spike. 50. *X. bicostata.*
49. Scapes ecostate, glabrous.
50. Sepals equaling the bracts, sparsely and minutely ciliate on the keel. 51. *X. filiscapa.*
50. Sepals exceeding the bracts, glabrous. 52. *X. steyermarkii.*
44. Lateral sepals connate.
51. Spikes 2–3-flowered; sepals carinate. 53. *X. connosepala.*
51. Spikes 1-flowered; sepals ecarinate. 54. *X. subuniflora.*
43. Spikes more than 3-flowered or the bracts ciliate.
52. Basal bracts about half as long as the spike.
53. Sepals red-pilose toward the apex; spike 8–10 mm long. 8. *X. seubertii.*
53. Sepals not more than minutely ciliate; spike smaller.
54. Bracts glabrous; scape terete or subterete. 55. *X. rubrolimbata.*
54. Bracts ciliate.
55. Fertile bracts acute; sepals equilateral. 56. *X. applanata.*
55. Fertile bracts broadly rounded; sepals inequilateral.
56. Sepals free; dorsal area nearly as long as the bracts. 57. *X. duidensis.*
56. Sepals short-connate; dorsal area not more than half as long as the upper bracts; flowers polystichous. 7. *X. uleana.*
52. Basal bracts much less than half as long as the spike.
57. Dorsal area occupying most of the bract; leaves and scape rugulose.
58. Scape much flattened toward the apex; scape, young and often mature leaf-blades densely long-ciliate. 58. *X. surinamensis.*
58. Scape subterete; scape and leaf-blades glabrous. 59. *X. frequens.*
57. Dorsal area relatively small.
59. Leaf-sheaths dark-castaneous at least at the base, mostly lustrous.
60. Blades abruptly narrower than the sheaths; flowers decussate, 4–5-ranked. 60. *X. contracta.*
60. Blades merging with the sheaths.
61. Plants long-caulescent; leaf-sheaths forming broad frond-like plates. 61. *X. frondosa.*
61. Plants short-caulescent or acaulescent; leaf-sheaths not forming broad plates.
62. Sheaths glabrous; blades 3.5–5 mm wide; bracts spirally arranged, broadly rounded. 62. *X. teinosperma.*
62. Sheaths ciliate; blades 0.7–2 mm wide.
63. Bracts dark; blades 2 mm wide; sheaths gradually widened toward the base. 63. *X. pratensis.*
63. Bracts pale; blades 0.7 mm wide; sheaths abruptly orbicular-dilated at the base making the plant subbulbous. 64. *X. araracuarae.*
59. Leaf-sheaths pale, opaque.
64. Leaf-sheaths basally densely long-ciliate.
65. Bracts carinate toward the apex. 65. *X. carinata.*
65. Bracts broadly convex, ecarinate.
66. Leaf-sheaths rugulose; blades tuberculate-ciliate. 23. *X. setigera.*
66. Leaf-sheaths and blades sulcate, otherwise even. 66. *X. malmeana.*
64. Leaf-sheaths eciliate.
67. Spike acute; bracts subacute.
68. Plant caulescent; sheath ligulate. 67. *X. cuatrecasana.*
68. Plant acaulescent; sheath eligulate. 68. *X. yutajensis.*
67. Spike broadly obtuse; bracts subtruncate.
69. Bracts soon lacerate. 69. *X. lacerata.*
69. Bracts entire.
70. Sepals subequilateral, lanceolate. 70. *X. subglabrata.*
70. Sepals strongly inequilateral, semi-elliptic.

71. Leaves smooth, 0.5–1 mm broad; staminodes penicillate. 71. *X. paraensis.*
71. Leaves either transverse-rugulose on the sides or tuberculate-scabrid on the edges, 2–3 mm broad; staminodes glabrous. 72. *X. savanensis.*

4. **Xyris involucrata** Nees ab Esenbeck in Jour. Bot. Hooker **2**: 397. 1840.

Type. *Schomburgk 1054,* "British Guiana in 1836–40."

Distribution. Extraordinarily distinctive and attractive because of the conspicuous radiate involucral bracts; a short-lived perennial confined to moist sandy savannas throughout Guayana, from alt. 100–1200 m, and on the Rio Negro in Brazil.

5. **Xyris spruceana** Malme, Bihang Sv. Vet.-akad. Handl. **26** (3)^{19}: 12. *pl. 1, f. 2.* 1901.

Type. Ad fluv. Guainia v Rio Negro supra ostium fluvensis Casiquiari, in 1854, *Spruce 2993* (isotype NY).

Distribution. Occasional in moist sandy places, chiefly savannas, at alt. 100–300 m; drainage of the upper Río Negro and its tributaries in Amazonian Venezuela and Colombia, viz., the Casiquiari, Guainía, Apaporis, Içana, and Vaupés.

6. **Xyris cryptantha** Maguire & Smith, sp. nov. Fig. 2, A–E.

Herbae acaules dense caespitosae, rhizomatibus nullis; foliis 7–9 cm longis, rigidis, laevibus; vaginis ca. 15 mm longis, rubro-brunneis, basi abrupte dilatatis, apice eligulatis et cum laminis confluentibus, intus dense longeque ciliatis, alibi glabris; laminis teretibus, subulato-acuminatis, 0.3 mm diam., glabris, pallido-punctulatis; scapo erecto, ad 12 cm alto, tereti, 0.3 mm diam., glabro, laevi; vagina scapi eas foliorum subaequans, breviter laminata; spica anguste obconica, 1–2-flora; bracteis duabus basilaribus anguste oblongis, obtusis, 8 mm longis, haud carinatis, marginibus albidis, membranaceis, mox laceratis, area dorsali magna, angustissima, acuminata, bracteis reliquis similibus sed gradatim minoribus; sepalis lateralibus liberis, linearibus, acutis, 5.5 mm longis, carinatis, glabris, laevibus; placentis basilaribus.

Type. Flowers yellow, locally frequent, Sabana Pacimoni, alt. 100 m, on right bank of Río Pacimoni, 50 km above mouth, 2 Oct 1958, Amazonas, Venezuela, *B. Maguire & J. J. Wurdack 41677* (holotype NY, isotype US). Paratype. Same locality, *41667*.

Distribution. This well marked species is presently known only from the Pacimoni savannas. It is perhaps most closely related to *X. uleana*.

7. **Xyris uleana** Malme, Repert. Nov. Sp. **3**: 113. 1906.

X. vaupesana Idrobo & Smith, Caldasia **6**: 237. *f. 26.* 1954; type: Caño Pacu, Río Vaupés, Colombia, *R. E. Schultes 5831* (US).

Type. In arenosis humidis, Manaos, Amazonas, Brasil, May 1902, *Ule 6171*.

Distribution. Guayana, chiefly on damp sand at low altitudes, on sandstone areas up to alt. 1200 m; Tafelberg, Suriname; Kaieteur, British Guiana; lower Rio Negro, Amazonas, Brazil; Vaupés, Colombia.

The var. *angustifolia* Lanjouw, Kew Bull. **1939**: 562 (1939) (isotype, *Sandwith 1421* [NY]), with narrow ("0.8 mm") leaves and subterete, hardly bicostate peduncles, is from the Kaieteur Savanna, British Guiana. *X. connectens* Malme, Ark. Bot. **19**(13) : 2 (1925), *Ducke 15060,* would belong here.

8. Xyris seubertii Alb. Nilsson, Sv. Vet.-akad. Handl. **24**(14) : 51 *pl. 4.* 1892.

X. calcarata Heimerl, Ann. Naturh. Hofm. Wien **21**: 68. *pl. 4. f. 1–3.* 1906.

Type. ''British Guiana, *Rich. Schomburgk n. 897*'' (isotype US).

Distribution. Venezuelan Guayana, Gran Sabana, Roraima region, infrequently collected; Rio Kukenán, vic. Mt. Roraima, *Steyermark 59190* (NY, US); *im Thurn 257* (US). South to Mato Grosso, Goiás, and Minas Gerais in Brazil.

9. Xyris thysanolepis Maguire & Smith, sp. nov. Fig. 3, A–F.

Herbae breviter caulescens, ramosae; ramis erectis vel adscendentibus; foliis obscure distichis, ad 40 cm longis, vix rigidis, ex sicco leviter sulcatis, glabris, margine haud incrassatis; vaginis ad 14 cm longis, basi gradatim dilatatis, apice eligulatis et cum laminis confluentibus; laminis valde applanatis, acuminatis, 4 mm latis; scapo ca. 70 cm alto, subtereti, ecostato vel 1–2-costato, costis scabridis exceptis glabro laeveque; vagina scapi subfoliacea, lamina brevi sed distincta praedita; spica subglobosa, 9 mm longa, multiflora; bracteis late ovatis, subacutis, sepala superantibus, laevibus, marginibus patentibus latis membranaceis rubris laceratis praeditis, area dorsali carentibus, duabus basilaribus valde carinatis, alteris apice obscure carinatis; sepalis lateralibus liberis, ellipticis vel spathulatis, subaequilateralibus, 6 mm longis, carina minutissime ciliata; staminodiis penicillatis; placentis basilaribus; seminibus fusiformibus, biapiculatis, 0.8 mm longis.

Type. Rare around moist depressions and swales bordering river, scrub forest near Summit Camp, alt. 1925 m, central section Chimantá Massif, 2 Feb 1955, Bolívar, Venezuela, *J. A. Steyermark & J. J. Wurdack 356* (holotype NY, isotype US).

Distribution. Known only by the type collection.

10. Xyris hymenachne Martius, Flora **24**^{2} (Beibl. 2) : 55. 1841.

Type. Prov. Minarum, Brazil, *Martius 872.*

Distribution. Central Brazilian Plateau and Venezuelan Guayana; infrequent in the Gran Sabana. VENEZUELA. Bolívar: Ptari-tepuí, *Steyermark 59841* (NY, US), and Uaipán-tepuí, *Phelps & Hitchcock 376* (NY); Amazonas: Cerro de la Neblina, *Maguire, Wurdack & Maguire 42200A;* south to São Paulo, Brazil.

11. Xyris concinna N. E. Brown, Trans. Linn. Soc. II. **6**: 68. 1901.

Type. Summit, Mt. Roraima [Venezuela], alt. 8600 ft, *McConnell & Quelch 496* (K).

Distribution. We have seen one additional specimen, *Tate 432* (NY), from the type locality.

12. Xyris submontana Gleason, Bull. Torrey Club **56**: 393. 1929.

Type. Philipp Swamp, Mount Roraima [Venezuela], alt. 5100–5200 ft, 11 Nov 1927, *Tate 334* (holotype NY).

Distribution. Known only by the type collection.

13. Xyris sipapoa Maguire & Smith, sp. nov. Fig. 4, A–F.

Herbae caulescentes, perennes (?); caudice ad 3 cm longo, subinde ramoso; foliis distincte distichis, 10–25 cm longis, margine incrassatis et minute denseque albido-ciliatis, alibi glabris; vaginis cum laminis confluentibus, basi abrupte lateque suborbiculari-dilatatis, brunneis lucidisque; laminis abrupte falcato-acutis, 3–6 mm latis; scapo 15–50 cm alto, 1.0–1.5 mm lato, parum compresso, costa unica pubescenti praedito; vagina scapi 6–18 cm longa, breviter foliaceo-laminata; spica oblongo-subglobosa, 10–12 mm longa, multiflora; bracteis haud decussatis, castaneis, laevibus, infimis suborbicularibus, alteris oblongis, apice carinatis breviter mucronatisque, conspicue hyalinis, per aetatem fimbriatis; sepalis anguste lanceolatis, acutis, 6–7 mm longis, bracteas paulo superantibus, ca. 1/3 connatis, carinatis, obscure ciliatis; placentis basilaribus (?); seminibus ca. 0.8 mm longis, ca. 0.2 mm latis, anguste oblongo-ellipticis, gradatim attenuatis et apice apiculatis, nigris, obscure costatis.

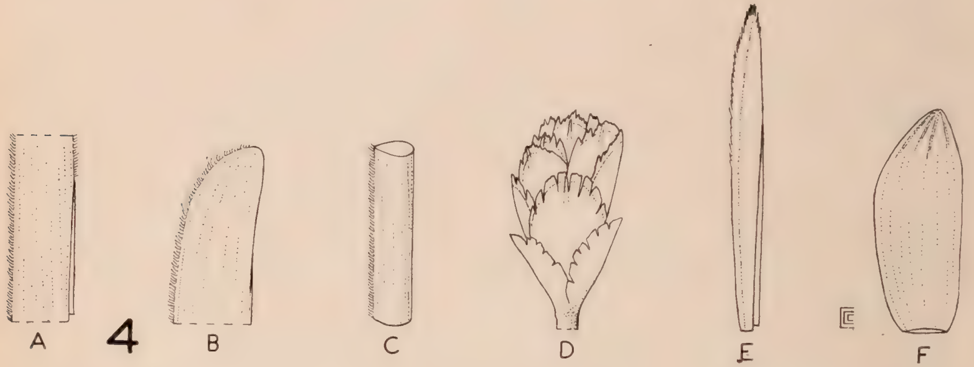


FIG. 4. *Xyris sipapoa.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2.5. E, sepal, × 5. F, seed, × 30.

Type. Frequent, banks of lower Caño Negro along open savannas, alt. 1400 m, Cerro Sipapo, 25 Dec 1948, Amazonas, Venezuela, *Bassett Maguire & Louis Politi 27911* (holotype NY, isotype US). Paratypes. Cerro Sipapo: frequent in bog savanna, terraces south of Caño Negro, alt. 1600 m, *Maguire & Politi 28194;* Campo Grande, alt. 1500 m, *Maguire & Politi 27684.*

Distribution. Known only from Cerro Sipapo, but there commonly distributed.

X. sipapoa is to be associated with and is most closely related to *X. submontana,* known only from the summit of Mt. Roraima on the British Guiana–Venezuelan frontier. *X. sipapoa* is distinguished superficially from *X. submontana* by the longer coarser caudex, more conspicuous broader sheath-bases, marginally pubescent leaf-blades (glabrous in the latter), larger, oblong-subglobose rather than depressed-subglobose heads, longer, less scarious-margined, smooth bracts, which in *X. submontana* (in the type) are strongly granulate, and in the narrower, longer sepals that exceed the bracts.

14. Xyris stenophylloides Malme, Bull. Torrey Club **58**: 323. 1931.

Type. Gorge of Caño Negro, Savanna Hills, growing in tussocks, Cerro Duida, Amazonas, Venezuela, alt. 4000 ft, *Tate 808* (NY).

Distribution. Known otherwise by *Steyermark 58211,* collected at the type locality.

15. Xyris atriceps Malme, Bull. Torrey Club **58**: 325. 1931.

Key to the Subspecies of *Xyris atriceps*

1. Floral bracts broadly obovate or orbicular, 3–4 mm long, strongly roughened and the margins quickly becoming strongly pectinate-lacerate; spikes broadly turbinate, ca. 7 mm long. subsp. *atriceps.*
1. Floral bracts oblong, or oblanceolate-oblong.
  2. Bracts oblong, 6–7 mm long, essentially smooth, tardily becoming lacerate; spikes narrowly turbinate, ca. 10 mm long. subsp. *neblinensis.*
  2. Bracts lanceolate-oblong, 4–5 mm long, strongly roughened, the margins quickly becoming pectinate-lacerate, heads 4–6 mm long. subsp. *chimantensis.*

Xyris atriceps subsp. **atriceps.**

Herbae cespitosae; spica late turbinata, ca. 7 mm longa; bracteis late obovatis vel orbicularibus, 3–4 mm longit, valde rugulosis, marginibus mox pectinato-laceratis.

Type. Forming tussocks, alt. 6700 ft, Cerro Duida, Amazonas, Venezuela, *G. H. H. Tate 688* (holotype NY).

Distribution. Initially collected by Tate and subsequently by Steyermark (No. *58185*) from the southern summits of Cerro Duida. The Steyermark specimens are immature.

Xyris atriceps subsp. **neblinensis** Maguire & Smith, subsp. nov.

Herbae cespitosae; foliis 4–5 dm longis, fere teretibus, 0.5–0.6 mm diam., basin versus valde scabris, apice obtuso; vaginis atro-castaneis, 3–5 cm longis, laevibus vel dorso paulo scabris, ligula 1–2 mm longa; scapo 5–6 dm alto, tereti, ca. 0.8 mm diam., sublaevi; vagina scapi ca. 10 cm longa, lamina 2–3 cm longa praedita; spica anguste turbinata, ca. 10 mm longa; bracteis oblongis, 6–7 mm longis, laevibus, ad marginem anguste scariosis et tarde pectinato-laceratis; sepalis lineari-subfalcatis, marginibus apicem versus paupere ciliolatis.

Type. In clumps, leaves terete, locally abundant, east escarpment of upper Cañon Grande Basin, alt. 1900 m, 15 Dec 1957, Cerro Neblina, Amazonas, Venezuela, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42416* (holotype NY, isotype US). Paratype. West Escarpment, alt. 1800 m, Cerro Neblina, *Maguire, Wurdack & Bunting 37244, Maguire, Wurdack & Maguire 42342.*

Distribution. Tussock-forming, abundant and generally distributed on summit savannas, this dominant herb was never observed to be freely flowering. Known only from Neblina.

Xyris atriceps subsp. **chimantensis** Maguire & Smith, subsp. nov.

Herbae ex comparatione parvae; foliis 12 cm haud superantibus; scapo plerumque 15–20 cm longo; spica ca. 6 mm longa; bracteis lanceolatis, plus minusve carinatis, valde rugosis, marginibus profunde pectinato-incisis.

Type. Sheaths blackish-purple at base, culms purple-black, involucre blackish, petals deep yellow, 5 mm long, locally frequent, Río Tirica, alt. 1925 m, 5 Feb 1955, Chimantá Massif, Bolívar, Venezuela, *Julian A. Steyermark & John J. Wurdack 485* (holotype NY, isotype US).

Distribution. Only the type collection known; quite distinctive in habit, size of spikes and form of spicular bracts.

16. Xyris decussata Gleason, Bull. Torrey Club **56**: 392. 1929.

Type. Summit Mt. Roraima, Bolívar, Venezuela, *Tate 427* (NY).

Distribution. Known only from Mt. Roraima, Ilu-tepuí, Ptari-tepuí, and the Chimantá Massif, all of the Gran Sabana, Bolívar, Venezuela.

Additional specimens. Roraima: *Steyermark 58806;* Chimantá: *Steyermark 75757, Steyermark & Wurdack 347, 487, Wurdack 34307;* Ptari-tepuí: *Steyermark 59683;* Ilu-tepuí: *Maguire 33408.*

17. Xyris witsenioides Oliver in im Thurn, Timehri **5**: 207. 1886; Trans. Linn. Soc. II. **2**: 285. *pl. 50, f. 9–15.* 1887.

Type. Mt. Roraima [Venezuela], *im Thurn 240* (K).

Distribution. Caulescent loose-tussock plants at high altitudes, the densely imbricate leaves forming broad frond-like plates. Venezuelan Guayana; frequent on the tepuís of the Gran Sabana and Cerro Neblina, Amazonas.

18. Xyris riparia Maguire & Smith, sp. nov. Fig. 5, A–E.

Herbae longe caulescens sed verisimiliter non ramosae; foliis densissime distichis et laminam frondosam formantibus, ad 24 cm longis; vaginis ca. 10 cm longis, ad basin versus gradatim dilatatis, apice eligulatis et cum laminis confluentibus, omnino atro-castaneis, laevibus, extus convexis ecarinatisque, intus dense ciliatis, alibi glabris; laminis linearibus, acuminatis, spiraliter tortis, 2 mm latis, sublaevibus, margine haud incrassatis, margine obscure scabridulis, alibi glabris; scapo ultra 30 cm alto, subtereti, ecostato, ex sicco leviter sulcato, glabro; vagina scapi quam foliis bene breviore, breviter laminata; spica subglobosa, 10 mm longa, multiflora; bracteis decussatis, atris, area dorsali carentibus, vetustis aliquid laceratis sed vix normaliter, basilaribus valde reductis, alteris ovatis, obtusis, sepala aequantibus vel superantibus; sepalis lateralibus liberis, equilateralibus, anguste lanceolatis, acuminatis, 7 mm longis, late carinatis et ad apicem versus serrulatis; placentis basilaribus.

Type. Flowers yellow, frequent in clumps at stream edge, scrub forest near Summit Camp, alt. 1925 m, Chimantá Massif, central section, 2 Feb 1955, Bolívar, Venezuela, *J. A. Steyermark & J. J. Wurdack 361* (holotype NY, isotype US).

19. Xyris ptariana Steyermark, Fieldiana Bot. **28**(1): 110. *f. 16, I, J.* 1951.

Type. Forming dense tufts, wet bluffs, alt. 2000 m, Ptari-tepuí, Gran Sabana, Bolívar, Venezuela, *Steyermark 59919* (isotype NY).

Distribution. High altitudes on Ptari-tepuí and the Chimantá Massif, Gran Sabana, Bolívar, and Cerro Sipapo, Amazonas, Venezuela.

20. Xyris xiphophylla Maguire & Smith, sp. nov. Fig. 6, A–E.

Herbae longe caulescens sed verisimiliter non ramosae; foliis densissime distichis et laminam frondosam formantibus, 24–30 cm longis, glabris; vaginis magnis, 12–15 cm longis, acute carinatis, apice 8–9 mm latis et ligula parva acuta praeditis, basi paulo ampliatis et atro-castaneis, alibi viridibus; laminis

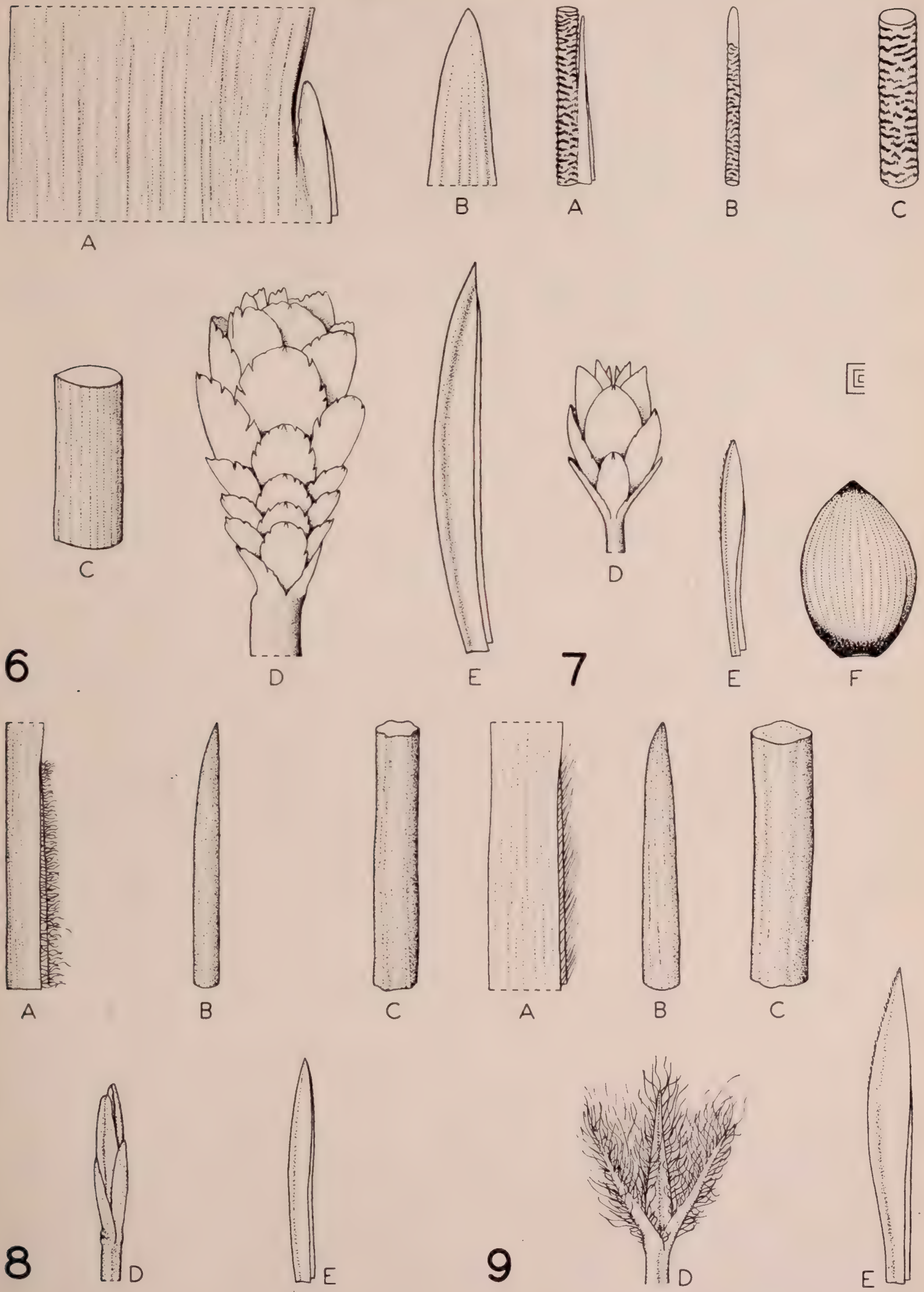


FIG. 6. *Xyris xiphophylla.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2. E, sepal, × 5. FIG. 7. *Xyris delicatula.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 3. E, sepal, × 5. F, seed, × 40. FIG. 8. *Xyris fusiformis.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 3. E, sepal, × 7.5. FIG. 9. *Xyris wurdackii.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 3. E, sepal, × 7.5.

asymmetricis, sublinearibus, acutis, 9 mm latis, minute sulcatis, extus fere rectis, intus curvatis, basi contractis, margine paulo incrassatis; scapo 50–70 cm alto, apice paulo complanato, ecostato, alibi subtereti multicostatoque, glabro; vagina scapi quam foliis multo brevioribus, breviter laminata; spica anguste obovoidea, 22 mm longa, multiflora; bracteis decussatis, atris, area dorsali carentibus, apice brevissime carinatis, sterilibus multis, valde reductis, alteris ellipticis, obtusis, supremis quam sepalis paulo brevioribus; sepalis lateralibus liberis, equilateralibus, linearibus, 12 mm longis, anguste carinatis, glabris laevibusque; placentis basilaribus.

Type. Flowers yellow, abundant in west escarpment savanna, 4–8 km south of Cumbre Camp, alt. 1850–1900 m, Cerro de la Neblina, Río Yatúa, 15 Jan 1954, Amazonas, Venezuela, *B. Maguire, J. J. Wurdack & G. S. Bunting 37312* (holotype NY, isotype US). Paratype. Low bush slopes near Cumbre Camp, alt. 1800 m, 4 Jan 1954, *37051.*

Distribution. Known only from the type locality.

21. **Xyris bicephala** Gleason, Brittonia **3**: 155. 1939.

Type. Auyán-tepuí, alt. 2200 m, Gran Sabana, Venezuela, *Tate 1114* (NY).

Distribution. Frequent in moist places in savannas from alt. 1000 m to higher elevations in the mountains of the Gran Sabana, Venezuela, and the Pakaraima Mountains of British Guiana.

Sometimes the peduncles of this species are monocephalous.

22. **Xyris roraimae** Malme in Pilger, Notizbl. Bot. Gart. Berlin **6**: 117. 1914.

Type. Auf den unteren Campos, 1700 m ü M., Jan 1910, Roraima [Venezuela], *Ule 8546* (isotype US).

Distribution. Known only by the type from Mt. Roraima, and *Maguire 33646* from Ilu-tepuí, Bolívar, Venezuela, the northernmost member of the Roraima chain.

23. **Xyris albescens** Steyermark, Fieldiana Bot. **28**(1): 105. *f. 16, A, B.* 1951.

Type. Ptari-tepuí, Gran Sabana, Bolívar, Venezuela, alt. 2000 m, *Steyermark 59734* (isotype NY).

Distribution. Known only by the type collection.

Doubtfully distinct from *X. decussata.*

24. **Xyris setigera** Oliver, Trans. Linn. Soc. II. Bot. **2**: 285. *pl. 50 A, f. 1–8.* 1887.

Type. Roraima [Venezuela], alt. 4000 ft, *im Thurn 62* (K).

Distribution. Generally distributed in sandy moist savannas, alt. 1000–2000 m, Gran Sabana, Venezuela, and the contiguous British Guiana Pakaraimas.

A strongly marked but somewhat variable plant; at low altitudes the leaves are apt to be short, usually 5–10 cm long; at higher altitudes (or wetter places) the leaves are characteristically 15–20 cm long. Plants of this habit represent the var. *elongata* Steyermark, Fieldiana Bot. **28**(1): 112. 1951.

25. **Xyris culmenicola** Steyermark, Fieldiana Bot. **28**(1): 108. 1951.

Type. Brocchinia Hills, alt. 1700–1980 m, Cerro Duida, Amazonas, Venezuela, *Steyermark 58198* (isotype NY); *Steyermark 58233* (paratype NY, US).

Distribution. Specimens from Cerro Guaiquinima, Bolívar, Venezuela, viz., *Maguire 32751, 32798,* have been referred here. Otherwise the species is known only from the type locality, and the nearby Cerro Huachamacari (*Maguire, Cowan & Wurdack 30123*).

26. Xyris esmeraldae Steyermark, Fieldiana Bot. **28**(1): 109. *f. 16, C.* 1951.

Type. Esmeralda Savanna, alt. 200 m, Cerro Duida, Amazonas, Venezuela, *Steyermark 57821* (isotype NY).

Distribution. Rather widely distributed in sandy savannas of southern Amazonas, Venezuela; adjacent Brazil; and Vaupés and Amazonas, Colombia.

27. Xyris tatei Malme, Bull. Torrey Club **58**: 323. *pl. 24, f. 1B.* 1931.

Type. Moist slopes of Savanna Hills, alt. 4400 ft, Cerro Duida, Amazonas, Venezuela, *Tate 835* (holotype NY).

Distribution. Represented otherwise only by *Tate 778* (NY) from the type locality.

28. Xyris lugubris Malme, Bull. Torrey Club **58**: 324. *pl. 24, f. 1A.* 1931.

Type. Summit Peak No. 7, alt. 7100 ft, Cerro Duida, Amazonas, Venezuela, *Tate 639* (holotype NY).

Distribution. Confined to the high sandstone mountains of Amazonas, Venezuela, viz., the Cerros Sipapo, Parú, Huachamacari, Duida, and Neblina, and doubtfully from the Chimantá Massif, Bolívar.

29. Xyris scabridula Steyermark, Fieldiana Bot. **28**(1): 111. 1951.

Type. Stems dark black green, around rills on rocky dry ridge top, Brocchinia Hills, alt. 1700–1900 m, Cerro Duida, Amazonas, Venezuela, *Steyermark 58168* (isotype NY).

Distribution. Known only by the type collection, and *Steyermark & Wurdack 1010* obtained on the Chimantá Massif, Bolívar.

30. Xyris delicatula Maguire & Smith, sp. nov. Fig. 7, A–F.

Herbae acaules, cespitosae; foliis ad 29 cm longis; vaginis 8–11 cm longis, sulcatis, rubescentibus, basi abrupte triangulari-auriculatis, intus dense longeque ciliatis, alibi glabris; laminis teretibus, subulato-acuminatis, 1 mm diametro, transverse rugulosis; scapo gracillimo, 28–43 cm alto, 0.5 mm diametro, tereti, ecostato, laeve, glabro; vagina scapi omnino foliacea, longe laminata; spica ellipsoidea, dein ex sicco obconica, 7–8 mm longa, subpauciflora; bracteis decussatis, integris, atris, area dorsali carentibus, late convexis, apice brevissime carinatis, basilaribus valde reductis, alteris late obovatis, sepala subaequantibus; sepalis lateralibus liberis, linearibus, acutis, 6 mm longis, anguste carinatis, juvenilibus dense piloso-ciliatis; laminis petalorum obovatis, 4 mm longis; staminodiis minimis, penicillatis; filamentis brevibus; antheris oblongis, 1.5 mm longis; placentis basilaribus; seminibus crasse ellipsoideis, 0.6 mm longis, biapiculatis.

Type. Frequent in wet hummocks, Camp Savanna, Campo Grande, alt. 1500 m, Cerro Sipapo (Paráque), 10 Dec 1948, Amazonas, Venezuela, *B. Maguire & L. Politi 27580* (holotype NY, isotype US).

Distribution. Known only by the type collection.

31. **Xyris exserta** Idrobo & Smith, Caldasia **6**: 229, *f. 21.* 1954.

Type. Flowers yellow; on land at rapids, Río Guainía, Caño Caribe (between Isla del Venado and San José) and vicinity, alt. 850–900 ft, Vaupés, Colombia, 2 Nov 1953, *R. E. Schultes, R. E. D. Baker & Isidoro Cabrera 18276* (holotype COL, isotype US).

Distribution. Known only by the type collection.

32. **Xyris fusiformis** Maguire & Smith, sp. nov. Fig. 8, A–E.

Herbae acaules, cespitosae; foliis 10–24 cm longis; vaginis 15–40 mm longis, dense sulcatis, rubro-brunneis, basi abrupte dilatatis et atro-castaneis, intus dense longeque ciliatis, alibi glabris; laminis teretibus, subulato-acuminatis, ca. 1 mm diametro, sulcatis, albido-punctulatis, glabris; scapo 8–21 cm alto, 0.5–0.8 mm diametro, tereti, ecostato, ex sicco sulcato, glabro; vagina scapi omnino foliacea, longe laminata sed foliis superata; spica fusiforme, 7–8 mm longa, 1–3-flora; bracteis basilaribus paulo reductis, alteris anguste ovatis, subacutis, tenuibus, glabris, area dorsali magna carinata sulcata praeditis, sepala aequantibus vel superantibus; sepalis lateralibus liberis, linearibus, obtusis, 6 mm longis, anguste carinatis, glabris laevibusque; placentis basilaribus, elongatis.

Type. Flowers yellow, Sabana El Venado on left bank of Caño Pimichín, above Pimichín, alt. 140 m, 10 Oct 1957, Río Guainía, Amazonas, Venezuela, *Maguire, Wurdack & Keith 41815* (holotype NY, isotype US). Paratypes. 23 Nov 1953, *B. Maguire & J. J. Wurdack 36356;* flowers yellow, frequent in Yapacana Savannas, alt. 125 m, northwest base of Cerro Yapacana, 16 Sep 1957, Alto Río Orinoco, *Maguire, Wurdack & Keith 41538.*

Distribution. Known only by the cited specimens.

33. **Xyris oxylepis** Idrobo & Smith, Caldasia **6**: 204. *f. 7.* 1954.

Type. Sabanas sobre piedras areniscas, alt. ca. 450 m, Río Kuduyarí, Cerro Yapobodá, 5 Oct 1951, Vaupés, Colombia, *R. E. Schultes & I. Cabrera 14234–13* (holotype COL, isotype US).

Distribution. Known only by the type collection.

34. **Xyris garcia-barrigae** Idrobo & Smith, Caldasia **6**: 204. *f. 8.* 1954.

Type. Sabana de la Angostura, alt. ca. 400 m, Río Caquetá, Araracuara, 21 Dec 1951, Amazonas, Colombia, *H. García-Barriga & R. E. Schultes 14168* (holotype COL, isotype US).

Distribution. Wet savannas at low altitude, Colombian and Venezuelan Amazonas. VENEZUELA. Amazonas: Savannas, alt. 4500 ft, in cumbre of Cerro Moriche, Río Ventuari, *Maguire, Cowan & Wurdack 30936A;* Sabana de Moyo, right bank, Río Orinoco, 10 km above mouth Río Ventuari, *Wurdack & Adderley 43711.* COLOMBIA. Vaupés: Cerro Yapobodá, *Schultes & Cabrera 14234* (COL), *Schultes, Baker & Cabrera 18495* (COL), *Allen 3207* (COL); Rio Paraná Pichuna, *Schultes & Cabrera 19924* (COL, NY), *19947* (COL); savannas 1 km w Cacagual, Río Atabapo, *Maguire, Wurdack & Bunting 36291.*

35. **Xyris wurdackii** Maguire & Smith, sp. nov. Fig. 9, A–E.

Herbae acaules, cespitosae; foliis 10–22 cm longis; vaginis 2–4 cm longis, dense sulcatis, rubro-brunneis, basi abrupte dilatatis et atro-castaneis, intus

dense longeque ciliatis, alibi glabris; laminis teretibus, subulato-acuminatis, 0.8–1.3 mm diametro, glabris, laevibus vel ex sicco plus minusve sulcatis, pallido-punctulatis; scapo 10–25 cm alto, 0.6–1.0 mm diametro, tereti, ecostato, glabro; vagina scapi eis foliorum simili, brevissime laminata; spica obovoidea, 7–8 mm longa, pluriflora, tomento albido longo fere omnino occulta; bracteis basilaribus haud vel vix reductis, alteris ovatis, acutis, sepala subaequantibus, area dorsali magna angusta praeditis; sepalis lateralibus liberis, lanceolatis, acuminatis, 4.5–5.5 mm longis, carinatis, ad apicem versus sparse ciliatis; placentis perjuvenilibus ignotis.

Key to the Subspecies of *Xyris wurdackii*

1. Leaves longitudinally punctate-striate, much exceeding the scapes in length; bracts narrowly triangularly lanceolate. subsp. *wurdackii.*
1. Leaves neither punctate nor striate, equaling or shorter than the scapes; bracts lanceolate, with curved margins. subsp. *caquetensis.*

Xyris wurdackii subsp. **wurdackii.** Fig. 9, A–E.

Laminis longitudinale striate pallido-punctulatis, quam scapis longioribus; bracteis anguste triangularibus, persistente dense tomentosis.

Type. Yavita-Pimichín trail near Pimichín, alt. 140 m, Río Guainía, 22 Nov 1953, Amazonas, Venezuela, *B. Maguire, J. J. Wurdack & G. S. Bunting 36366A* (holotype NY, isotype US).

Distribution. Known only by the type collection.

Xyris wurdackii subsp. **caquetensis** Maguire & Smith, subsp. nov.

Laminis laevibus non punctulatis, quam scapis brevioribus vel subaequalibus; bracteis lanceolatis, glabrescentibus.

Type. Frequent in scrub savanna, Araracuara, Río Caquetá, 5 Sep 1959, Amazonas, Colombia, *B. Maguire, C. K. Maguire & A. Fernández 44129* (holotype NY, isotype US). Paratype. Araracuara Savannas, 6 Sep 1959, *44173.*

Distribution. Known only from the type locality.

Specimens of subsp. *wurdackii* are readily distinguished from the Caquetá variant by their coarser, longer, fewer leaves, fewer scapes (1 or 2, in subsp. *caquetensis* commonly 3–5), and persistently densely tomentose, narrower bracts, which in the Colombian variant are broader and become at length somewhat glabrescent.

36. **Xyris aquatica** Idrobo & Smith, Caldasia **6**: 206. *f. 9.* 1954.

Type. On rocks in swift brook, Río Caquetá, vicinity of La Pedrera, Apr 1924, Amazonas, Colombia, *R. E. Schultes 5855* (holotype COL, isotype US). Paratype. Rio Marmellos, Jul 1948, Amazonas, Brazil, *R. E. Schultes & F. López 10307* (US).

Distribution. Known only by the cited specimens.

37. **Xyris terrestris** Idrobo & Smith, Caldasia **6**: 208, *f. 10.* 1954.

Type. Cerro de Caẽnda (sabanas), alt. 380–670 m, Río Kubiyú, 4 Nov 1952, Vaupés, Colombia, *H. García-Barriga 15090* (holotype COL, isotype US). Paratypes. Río Karurú, Vaupés, *Schultes & Cabrera 19179* (COL); Río Kuduyarí, Vaupés, *Schultes & Cabrera 14235-A* (COL).

Distribution. Known only from Vaupés, Colombia.

38. Xyris juncifolia Maguire & Smith, sp. nov. Fig. 10, A–E.

Herbae acaules, cespitosae; foliis ad 60 cm longis; vaginis 5–11 cm longis, basin versus gradatim ampliatis, sulcatis, pallide brunneis, plus minusve rugulosis, eciliatis, apice late breviterque ligulatis; laminis teretibus, subulato-acuminatis, 2 mm diametro, ex sicco sulcatis; scapo 60–77 cm alto, 1–1.5 mm diametro, tereti, ecostato, glabro; vagina scapi foliacea, longissime laminata; spica ellipsoidea vel obovoidea, 14–20 mm longa, multiflora; bracteis basilaribus sterilibus multis, valde reductis, alteris ellipticis, late obtusis, sepala superantibus, area dorsali subelliptica carinata praeditis; sepalis lateralibus liberis, valde inaequilateralibus, ellipticis, obtusis, 5.5 mm longis, late carinatis, brevissime ciliatis; placentis basilaribus.

Type. Leaves rounded, in clumps, common in Cumbre Camp, alt. 2000 m, Cerro Guaiquinima, Río Paragua, 25 Dec 1951, Bolívar, Venezuela, *Bassett Maguire 32750* (holotype NY, isotype US). Paratypes. Abundant bog-marsh herb and along water course, North Valley, alt. 1700 m, 10–12 Jan 1952, *33055;* flowers yellow, frequent in moist open areas, cumbre along west rim south for 6 km from camp caño, alt. 2000 m, Serranía Parú; Río Parú, Caño Asísa, Río Ventuari, 1 Feb 1951, Amazonas, Venezuela, *Cowan & Wurdack 31284, 31185.*

Distribution. Known only by the cited specimens.

39. Xyris neblinae Maguire & Smith, sp. nov. Fig. 11, A–E.

Herbae e fragmentis solum cognitae, verisimiliter acaules et cespitosae; foliis ca. 80 cm longis; vaginis maximis, ad 29 cm longis, basin versus gradatim ampliatis, apice quam laminis paulo latioribus, marginibus angustis pallidis exceptis omnino atro-castaneis, obscure rugulosis; laminis teretibus, subulato-acuminatis, 1.5 mm diametro, laevibus; scapo 80 cm alto, tereti, ecostato, ex sicco leviter sulcato, glabro; vagina scapi subfoliacea, lamina ad 4 cm longa praedita; spica late fusiforme, 25 mm longa, multiflora; bracteis basilaribus sterilibus multis, valde reductis, alteris ellipticis, late obtusis, sepala subaequantibus, area dorsali anguste ovata carinata praeditis; sepalis lateralibus liberis, aequilateralibus, lineari-lanceolatis, acutis, 9 mm longis, late carinatis, dense ciliatis; placentis vetustis ignotis.

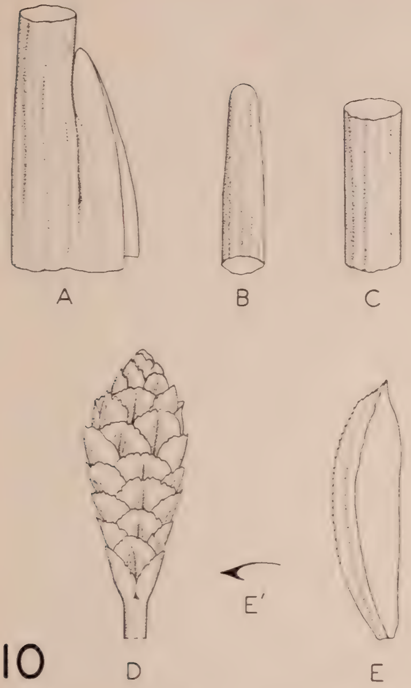
Type. Summit, savanna near west escarpment, 2 km north of Cumbre Camp, occasional, alt. 1800 m, Cerro de la Neblina, Río Yatúa, 12 Jan 1954, Amazonas, Venezuela, *B. Maguire, J. J. Wurdack & G. S. Bunting 37243* (holotype NY, isotype VEN, US). Paratypes. Cerro de la Neblina, *Maguire, Wurdack & Maguire 42381, 42301; Maguire, Wurdack & Bunting 37216, 37315.*

Distribution. Known only by the type collections.

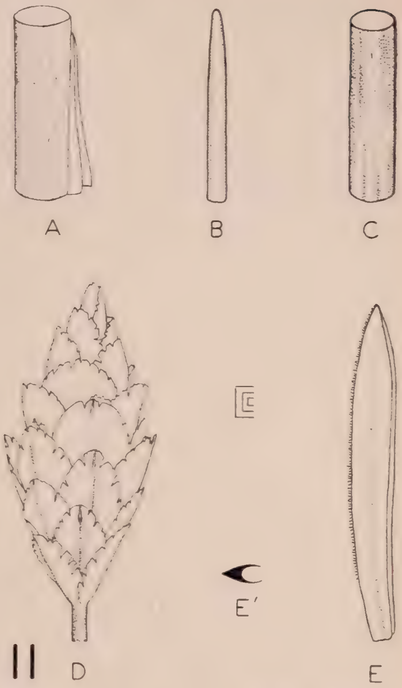
40. Xyris longiceps Malme, Rec. Trav. Bot. Néerl. **9**: 131. 1912.

Type. In arenosis inundatis, Suriname, *Splitgerber 978* (L).

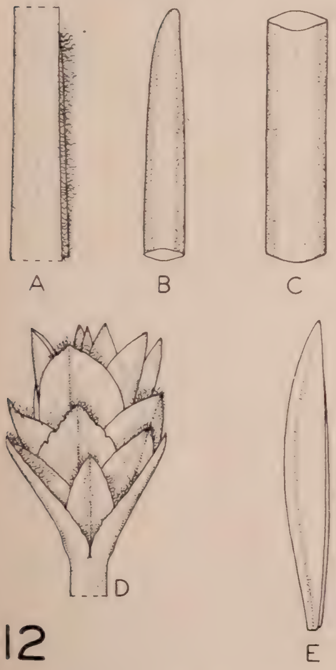
Distribution. Moist sandy savannas. SURINAME. Tafelberg, *Maguire 24259;* Zanderij, *Maguire 23673, 23718.* VENEZUELA. Amazonas: Esmeralda, *Tate 301* (NY), *Steyermark 58407* (NY); Serranía Parú, *Phelps & Hitchcock 461* (NY). COLOMBIA. Yuruparí, Río Vaupés, *García-Barriga 14936* (COL, NY, US); Araracuara Savannas, Río Caquetá, *Maguire, Maguire & Fernández 44127* (COL, NY, US), *44162* (COL, NY, US). BRAZIL. Amazonas (var. *polystachya* Smith & Downs).



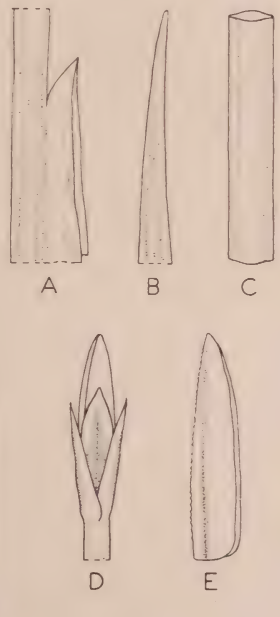
10



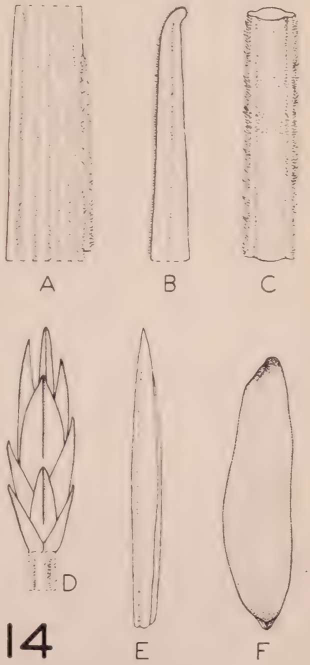
11



12



13



14

FIG. 10. *Xyris juncifolia.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2. E, sepal, × 5. FIG. 11. *Xyris neblinae.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2. E, sepal, × 5. FIG. 12. *Xyris arachnoidea.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 4. E, sepal, × 7.5. FIG. 13. *Xyris rugulosa.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 5. E, sepal, × 7.5. FIG. 14. *Xyris bicostata.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 3. E, sepal, × 5. F, seed, × 30.

41. **Xyris stenostachya** Steyermark, Fieldiana Bot. **28**(1): 113. *f. 16*, K, L. 1951.

Type. Among rock outcrops, alt. 100 m, Sanariapo, Río Orinoco, Amazonas, Venezuela, *Steyermark 58437* (isotype NY).

Distribution. Frequent in moist sandy soil at low altitudes, chiefly above the Great Bend of the Orinoco. VENEZUELA. Bolívar: La Urbana, *Maguire & Maguire 28989*. Amazonas: Puerto Ayacucho, *Maguire, Cowan & Wurdack 29243, Maguire, Wurdack & Bunting 36037;* Yapacana Savanna, *Maguire, Cowan & Wurdack 30787;* Cerro San Borja, *Wurdack & Monachino 39845;* Salto de Humito, Río Villacoa, *Wurdack & Monachino 41164.*

42. **Xyris arachnoidea** Maguire & Smith, sp. nov. Fig. 12, A–E.

Herbae acaules, cespitosae; foliis 15–18 cm longis; vaginis 3–4 cm longis, sulcatis, rubescentibus, basi abrupte triangulari-auriculatis, apice eligulatis et cum laminis confluentibus, intus longe denseque ciliatis, alibi glabris; laminis linearibus, apice subacutis et leviter falcatis, 1.3 mm latis, glabris, sulcatis, rugulosis, margine haud vel vix incrassatis; scapo 20–33 cm alto, glabro, ad apicem versus applanato, bicostato, 1 mm lato; vagina scapi eis foliorum simili, breviter laminata; spica obovoidea, 7–8 mm longa, pluriflora, dense arachnoidea; bracteis basilaribus valde reductis, alteris late ovatis, acutis, sepala subaequantibus, area dorsali magna carinata praeditis; sepalis lateralibus liberis, aequilateralibus, lanceolatis, acutis, 5.5 mm longis, late carinatis, glabris; placentis basilaribus, elongatis.

Type. Flowers yellow, occasional, Savanna III, northwest base of Cerro Yapacana, alt. 150 m, Alto Río Orinoco, 17 Mar 1953, Amazonas, Venezuela, *Bassett Maguire & John J. Wurdack 34570* (holotype NY, isotype US).

Distribution. Known only by the type collection.

43. **Xyris lomatophylla** Martius, Flora **24**^{2}: 57. 1841.

Type. In campis M[artius], Arara Coara [Amazonas, Colombia].

Distribution. Moist sandy savannas, Upper Orinoco and Río Negro drainages. COLOMBIA. Amazonas: Araracuara Savannas, *Maguire, Maguire & Fernández 44111, 44172;* Vaupés: Cacagual Savanna, Río Atabapo, *Maguire, Wurdack & Bunting 36394.* VENEZUELA. Amazonas: Esmeralda, *Tate 294* (NY); Yapacana Savanna III, *Maguire, Cowan & Wurdack 30476, 30477;* Sabana El Venado, Caño Pimichín, Río Guainía, *Maguire, Wurdack & Bunting 36359.* BRAZIL. Alto Rio Tapajos, southern Pará, *Egler & Raimundo 952* (MG, US).

44. **Xyris globosa** Alb. Nilss. Sv. Vet.-akad. Handl. **24** (14): 57. *pl. 3.* 1892.

Type. Prope Esmeralda ad flumen Orinoco, *Spruce 3244* (holotype S, isotype NY).

Distribution. Thus far known only from Venezuelan Amazonas but is to be expected to occur in Colombian Guayana also. Savannas of the middle and upper Orinoco River. VENEZUELA. Amazonas: Esmeralda, *Steyermark 57826* (NY); Cerro Moriche, Río Ventuari, *Maguire, Cowan & Wurdack 30897, 30936, 30992;* Yapacana Savannas, *Maguire, Cowan & Wurdack 30475, Maguire, Wurdack & Bunting 36583A;* Sabana El Venado, Caño Pimichín, *Maguire, Wurdack & Bunting 36360.* Bolívar: Río Orinoco between Río Horeda & Cerro Gavilan, *Wurdack & Monachino 39952.*

45. Xyris lanulobractea Steyermark, Fieldiana Bot. **28** (1) : 109. *f. 16, D–H.* 1951.

Type. Swampy ground, alt. 1200 m, Kavanayén, Gran Sabana, Bolívar, Venezuela, *Steyermark 59336* (isotype NY).

Distribution. Infrequently collected herb of wet sandy areas, apparently confined to the Gran Sabana. Other than the type collection we have only *Maguire 33234,* from savanna between Uarupata and Enemasic at alt. 1000 m.

46. Xyris yapobodensis Idrobo & Smith, Caldasia **6**: 231. *f. 22.* 1954.

Type. Elevated sandstone savanna Yapobodá, alto [Río] Cuduyari, ca. alt. 400 m, 10 Dec 1934, Vaupés, Colombia, *P. H. Allen 3287* (holotype MO).

Distribution. Apparently known only by the type collection.

47. Xyris cyperoides Gleason, Bull. Torrey Club **56**: 17. 1929.

Type. Kaieteur Savanna, British Guiana, Sep–Oct 1881, *Jenman 1056* (K).

Distribution. Apparently known only by the type collection.

48. Xyris rugulosa Maguire & Smith, sp. nov. Fig. 13, A–E.

Herbae acaules vel breviter caulescentes, cespitosae; foliis lineari-ensiformibus, ad 4 cm longis; vaginis ca. 1 cm longis, sulcatis, rubescentibus, glabris, apice ligulatis et quam laminis abrupte latioribus, basin versus gradatim ampliatis; laminis rectis, acuminatis, 0.6–1.0 mm latis, transverse rugulosis, margine valde incrassatis; scapo 4–6 (–13) cm alto, 0.5 mm diametro, subtereti, bicostato, ruguloso; vagina scapi eis foliorum simili, sine lamina; spica anguste fusiforme, 4–5 mm longa, uniflora; bracteis anguste lanceolatis, subacutis, integris, tenuibus, glabris, area dorsali magna angusta viridi laeve praeditis, 4 basilaribus sterilibus 2.5 mm longis, unica fertili subduplo majore, sepala subaequanti; sepalis lateralibus liberis, subaequilateralibus, anguste oblongis, subacutis, 4 mm longis, anguste carinatis, apicem versus brevissime ciliatis, alibi glabris; placentis basilaribus.

Type. Frequent along banks of small shaded stream, Caño Negro, alt. 1300 m, Cerro Sipapo, 15 Dec 1948, Amazonas, Venezuela, *Bassett Maguire & Louis Politi 27699* (holotype NY, isotype US). Paratypes. Petals erose, yellow, frequent on banks along Lower Caño Negro, alt. 1400 m, 25 Dec 1948, *Maguire & Politi 27916;* frequent on white sand, savanna vicinity of Base Camp, 30 Dec 1948, *Maguire & Politi 28034.*

Distribution. Known only from Cerro Sipapo.

49. Xyris guianensis Steudel, Syn. Pl. Glum. **2**: 285. 1855.

X. gardneri Malme, Bihang Sv. Vet.-akad. Handl. **26**, Afd. 3 (19):8. *pl. 1, f. 1.* 1901. Ceará, Brazil, *Gardner 1058.*

Type. "British Guiana," *Rich. Schomburgk 1058* (K).

Distribution. Southern Venezuela south to Goiás, Brazil. BRAZIL. Rio Branco: Shuurutirin Savanna, *Guppy 549A* [*F. D. 7564A*] (NY). VENEZUELA. Bolívar: Sabana de Triana, 50 km suroeste de El Dorado, *Steyermark 89680* (NY).; 30 km below La Urbana, Río Orinoco, *Maguire & Maguire 29084;* Uriman, *Steyermark & Wurdack 44.*

50. Xyris bicostata Maguire & Smith, sp. nov. Fig. 14, A–F.

Herbae acaules, cespitosae; foliis ad 15 cm longis; vaginis 4–6 cm longis, sulcatis, pallide brunneis, apice eligulatis et cum laminis confluentibus, basi abrupte dilatatis et atrioribus, intus dense longeque ciliatis; laminis linearibus, acutis, 0.8 mm latis, sulcatis, margine paulo incrassatis et pallido-ciliatis; scapo 15–20 cm alto, subtereti, 0.5 mm diametro, bicostato, costis ciliatis exceptis glabro; vagina scapi omnino foliacea, longe laminata; spica anguste fusiforme, dein ex sicco obconica, 9–10 mm longa, biflora; bracteis lanceolatis, acutis, integris, glabris, valde carinatis, area dorsali magna lineari praeditis, basilaribus valde reductis, alteris sepala superantibus; sepalis lateralibus liberis, aequilateralibus, linearibus, acutis, 7 mm longis, anguste carinatis, glabris; placentis basilaribus.

Type. Flowers yellow, frequent on mossy rocky banks, dense woodland along Right Fork of Caño de Díos, alt. 1800 m, Summit Camp, Cerro Huachamacari, Río Cunucunuma, 13 Dec 1950, Amazonas, Venezuela, *Bassett Maguire, R. S. Cowan & John J. Wurdack 30169* (holotype NY, isotypes S, VEN, US).

Distribution. Known only by the type collection.

51. Xyris filiscapa Malme, Repert. Nov. Sp. **3**: 112. 1906.

Type. In arenosis humidis, Manáos, Amazonas, Brasil, *Ule 6172* (S, US).

Distribution. Vaupés, Colombia.

52. Xyris steyermarkii Maguire & Smith, sp. nov. Fig. 15, A–E.

Herbae subacaules, cespitosae; foliis lineari-ensiformibus, 3–6 cm longis; vaginis ca. 15 mm longis, sublaevibus, pallidis, apice eligulatis et cum laminis confluentibus, ad basin versus gradatim ampliatis, intus dense ciliatis, alibi glabris; laminis minutissime falcatis, 0.5 mm latis, glabris, sublaevibus, margine haud incrassatis; scapo 4–12 cm alto, 0.3 mm diametro, tereti, ecostato, ex sicco plus minusve sulcato, glabro; vagina scapi eis foliorum simili, breviter laminata; spica anguste fusiforme, 6–7 mm longa, 1–2-flora; bracteis lanceolatis, acutis, tenuibus, integris, area dorsali magna angusta rubra praeditis, basilaribus valde reductis, alteris subduplo majoribus sed quam sepalis distincte brevioribus; sepalis lateralibus liberis, linearibus, acutis, 5.5 mm longis, glabris, angustissime carinatis; placentis basilaribus.

Type. Flowers minute, yellow, locally frequent along stream banks, Caño Mojado, between base of upper falls and drop to escarpment, alt. 1895–1910 m, summit, Chimantá Massif, Torono-tepuí, 23 Feb 1955, Bolívar, Venezuela, *Julian A. Steyermark & John J. Wurdack 1096* (holotype NY, isotype US). Paratypes. South-facing forested slopes above valley of South Caño, on summit, alt. 1955–2090 m, locally frequent, 23 Feb 1955, *Steyermark & Wurdack 1122;* rare in moist moss, sandy slopes at base of rock face along Río Tirica, above Middle Falls below Summit Camp, alt. 1925 m, 5 Feb 1955, *Steyermark & Wurdack 468.*

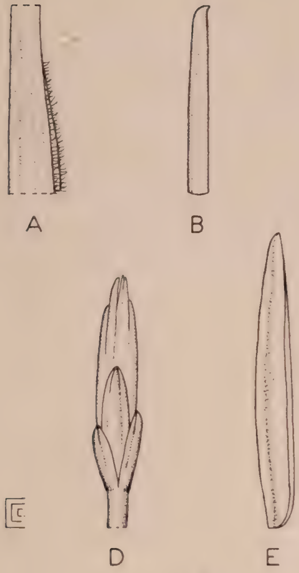
Distribution. Known definitely only from the Chimantá Massif.

A collection, *Steyermark 60306,* from Ptari-tepuí, Gran Sabana, is doubtfully referred to this species.

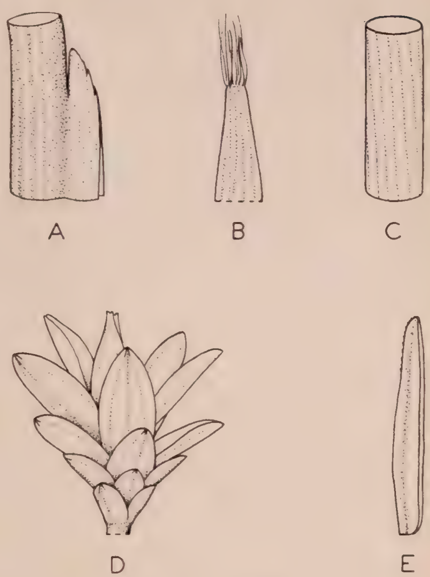
53. Xyris connosepala Lanjouw & Lindeman, Bull. Torrey Club **75**: 639. 1948.

Type. Frequent in wet sphagnum-filled cracks in rocks, Savanna IV, Tafelberg, Suriname, *Maguire 24395a* (holotype U, isotype NY).

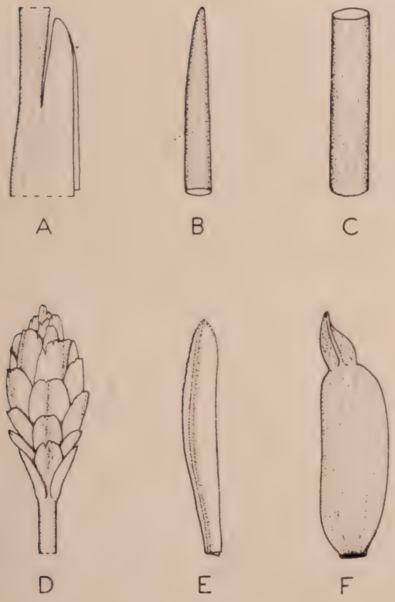
Distribution. Known certainly only from Tafelberg, a discontinuous element of Guayana.



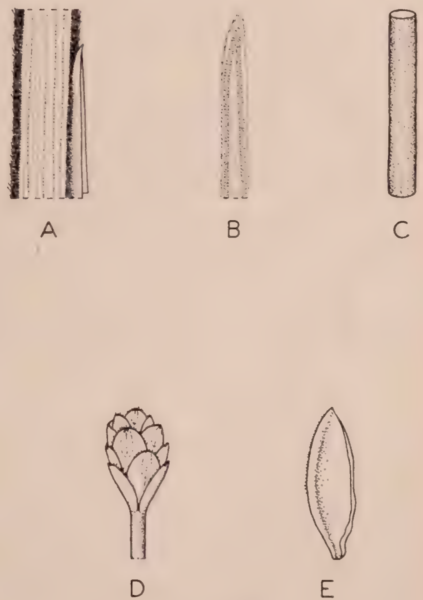
15



16



17



18

FIG. 15. *Xyris steyermarkii.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 4. E, sepal, × 7.5. FIG. 16. *Xyris frequens.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2. E, sepal, × 5. FIG. 17. *Xyris contracta.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 1.5. E, sepal, × 3.5. F, seed, × 15. FIG. 18. *Xyris frondosa.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2. E, sepal, × 5.

54. **Xyris subuniflora** Malme, Rec. Trav. Bot. Néerl. **9**: 129. 1912.

X. capillaris Steyermark, non Malme. Type. Swampy rills in Esmeralda Savanna, Amazonas, Venezuela, *Steyermark 57835* (isotype NY).

Type. In arenosis humidis, Suriname, *Splitberger 990* (L).

Distribution. Delicate, often cespitose plants of moist sandy areas at low altitude. SURINAME. *Splitberger 990* (holotype). BRITISH GUIANA. Kaieteur Savanna (acc. Sandw.), *Sandwith 1373* (K). VENEZUELA. Río Yatua margins just above Piedra Arauicaua, Amazonas, *Maguire, Wurdack & Maguire 41629.* COLOMBIA. Caño del Caribe, Río Guainía, 2° 45′N–67° 50′W, Vaupés, *Schultes, Baker & Cabrera 18276-A* (COL, US).

55. **Xyris rubrolimbata** Heimerl, Ann. Naturh. Hofmus. Wien **21**: 70. *pl. 4, f. 4–6.* 1906.

Type. Moist sandy woods, Lomo, 100 km northwest of mouth of Casiquiare, Vaupés, Colombia, *Spruce 2994* (W, destroyed; F photo no. 30008; K).

Distribution. Vaupés, Colombia and adjacent Venezuela, at low elevations.

56. **Xyris applanata** Idrobo & Smith, Caldasia **6**: 238. *f. 27.* 1954.

Type. Cerro Isibukurí, Río Kananarí, Vaupés, Colombia, *Schultes & Cabrera 14466* (holotype COL, isotype NY, US).

Distribution. Known otherwise only by *Schultes & Cabrera 13401,* collected at the type locality.

57. **Xyris duidensis** Malme, Bull. Torrey Club **58**: 325. 1931.

Type. Gorge of Caño Negro, Savanna Hills, alt. 4000 ft, Cerro Duida, Amazonas, Venezuela, *G. H. H. Tate 811* (holotype NY).

Distribution. Sandstone mountain summits, alt. 1100–2000 m, confined to Venezuelan Guayana. VENEZUELA. Bolívar: Auyán-tepuí, *Tate 1319* (NY); *Vareschi & Foldats 4721* (NY), *4762* (NY). Amazonas: Cerro Duida, *Tate 544* (NY), *Steyermark 58145* (NY); Cerro Sipapo, *Maguire & Politi 27916, 28469;* Cerro Guanay, *Maguire, Phelps, Hitchcock & Budowski 31704.*

58. **Xyris surinamensis** K. Sprengel, Tent. Suppl. Syst. Veg. Linn. 2. 1828.

X. eriophylla Reichb. in Pl. Exs. Weigelt 1827 (?).

Type. Suriname, *Weigelt.*

Distribution. Plants of sandy savannas, more often at low altitudes but reaching elevations of 800 m. Common and widespread in coastal Guiana and in Guayana. Variable in density of pubescence; the strongly pubescent or lanate forms have been called *X. eriophylla* Reichb., merely because of the significance of the specific epithet.

59. **Xyris frequens** Maguire & Smith, sp. nov. Fig. 16, A–E.

Herbae acaules, cespitosae; foliis lineari-ensiformibus, 19–29 cm longis, plus minusve rugulosis; vaginis 3–7 cm longis, pallidis, apice eligulatis et cum laminis confluentibus, ad basin versus gradatim ampliatis, intus ciliatis, alibi glabris; laminis 0.7–1.2 mm latis, paulo compressis, apice piloso excepto glabris; scapo

25–34 cm alto, 1–1.5 mm diametro, subtereti, plus minusve ruguloso; vagina scapi foliacea, longe laminata; spica ex sicco obovoidea, 11–12 mm longa, submultiflora; bracteis decussatis, ellipticis, subacutis, integris, area dorsali maxima carinata rugosa praeditis, basilaribus sterilibus multis, valde reductis, alteris sepala superantibus; sepalis lateralibus liberis, aequilateralibus, linearibus, obtusis, 5.5 mm longis, late carinatis, ad apicem versus sparse ciliatis; placentis basilaribus.

Type. Flowers yellow, frequent, sabanita along Caño Pimichín on right bank 1 km above Pimichín, Río Guainía, alt. 140 m, 24 Nov 1953, Amazonas, Venezuela, *B. Maguire & J. J. Wurdack 36383* (holotype NY, isotype US). Paratype. Flowers yellow, frequent, Savanna III, northwest base of Cerro Yapacana, alt. 150 m, 17 Mar 1953, Amazonas, Venezuela, *Maguire & Wurdack 34572.*

Distribution. Known only by the cited specimens.

60. **Xyris contracta** Maguire & Smith, sp. nov. Fig. 17, A–F.

Herbae subacaules, cespitosae; foliis lineari-ensiformibus, ad 18 cm longis, glabris; vaginis 2 cm longis, apice late ligulatis et quam laminis abrupte latioribus, ad basin versus gradatim ampliatis, laevibus, atro-castaneis, lucidis; laminis tortuosis, acuminatis, 1–1.5 mm latis, laevibus, margine haud incrassatis; scapo 20–26 cm alto, 1 mm diametro, subtereti, ecostato, laeve; vagina scapi foliacea, longe laminata; spica obovoidea, 14 mm longa, submultiflora; bracteis decussatis, ellipticis, late rotundatis, apice minutissime fimbriato excepto integris, area dorsali parva carinata praeditis, basilaribus sterilibus multis, valde reductis, alteris sepala fere aequantibus; sepalo anteriore saccato, mox deciduo; sepalis lateralibus liberis, aequilateralibus, linearibus, obtusis, 9 mm longis, late carinatis, glabris; placentis basilaribus.

Type. Flowers yellow, infrequent in stream bed, Upper Cañon Grande, alt. 1900 m, Cerro de la Neblina, Río Yatua, 11 Dec 1957, Amazonas, Venezuela, *B. Maguire, J. J. Wurdack & C. K. Maguire 42359* (holotype NY, isotype US).

Distribution. Known only by the type collection.

61. **Xyris frondosa** Maguire & Smith, sp. nov. Fig. 18, A–E.

Herbae caulescentes, ramosae; foliis lineari-ensiformibus, laminam frondosam formantibus, 12–20 cm longis; vaginis 3–4 cm longis, apice anguste ligulatis et quam laminis paulo latioribus, ad basin versus gradatim ampliatis, glabris, laevibus, atro-castaneis, lucidis; laminis obtusis, 1.5–2 mm latis, sulcatis, anguste atro-marginatis, ciliatis, alibi glabris; scapo 12–28 cm alto, 0.5–0.8 mm diametro, subtereti, laevi; vagina scapi eis foliorum simili, brevissime laminata; spica obovoidea, 7–9 mm longa, pauciflora; bracteis ellipticis, late rotundatis, integris, apice minutissime albo-ciliatis, area dorsali angusta praeditis, basilaribus paulo reductis, alteris sepala bene superantibus; sepalis lateralibus liberis, paulo inaequilateralibus, ellipticis, obtusis, 4 mm longis, late carinatis, brevissime ciliatis; placentis basilaribus.

Type. Older leaves twisted, petals 4 mm long, 4 mm broad, frequent in scrub forest near Summit Camp, alt. 1925 m, Central Section, Chimantá Massif, 2 Feb 1955, Bolívar, Venezuela, *J. A. Steyermark & J. J. Wurdack 346* (holotype NY, isotype US). Paratypes. Cerro Guaiquinima, Alto Río Paragua, Bolívar, Venezuela, Oct 1943, *F. Cardona 946* in part (NY, US); bog plant with yellow flowers, the most abundant of all savanna plants, open savannas 1 km south of Cumbre Camp, alt. 1800 m, 29 Dec 1951, *B. Maguire 32798a.*

Distribution. Known only by the cited collections.

62. Xyris teinosperma Idrobo & Smith, Caldasia **6**: 224. *f. 18.* 1954.

Type. Yapobodá, Vaupés, Colombia, 10 Dec 1943, *P. H. Allen 3195* (holotype COL, isotype MO).

Distribution. Plants of inundable savannas at low altitudes; drainage of the Alto Orinoco and Upper Río Negro. COLOMBIA. Vaupés: Cerro Yapobodá, *Schultes & Cabrera 14384* (COL), *19972* (COL); Puerto Colombia, *Schultes 18188* (COL); Cerro de Cañenda, *García-Barriga 15063A* (COL); Río Paraná Pichuna, *Schultes & Cabrera 19942;* Puerto Colombia, *Maguire, Wurdack & Keith 41838* (NY, US, VEN). VENEZUELA. Amazonas: Yapacana Savannas, Río Orinoco, *Maguire & Wurdack 34564, Maguire, Wurdack & Bunting 36559A, Maguire, Wurdack & Keith 41548;* Sabana El Venado, Caño Pimichín, Río Guainía, *Maguire, Wurdack & Bunting 36319, Wurdack & Adderley 43293;* Sabana, Maroa, Río Guainía, *Maguire, Wurdack & Keith 41758.*

63. Xyris pratensis Maguire & Smith, sp. nov. Fig. 19, A–E.

Herbae acaules, cespitosae; foliis lineari-ensiformibus, 30–37 cm longis; vaginis 5–11 cm longis, sulcatis, rubescentibus, apice eligulatis et cum laminis confluentibus, ad basin versus gradatim latioribus dein triangulari-auriculatis et atro-castaneis; laminis acutis, minute falcatis, 2 mm latis, sulcatis, margine paulo incrassatis, ciliatis, alibi glabris; scapo ultra 50 cm alto, paulo complanato, 1.5 mm lato, costato, ciliato; vagina scapi foliacea, longe laminata; spica ellipsoidea, dein ex sicco obovoidea, 8–10 mm longa, submultiflora; bracteis decussatis, late ovatis, subacutis, atris, area dorsali angusta valde carinata praeditis, basilaribus valde reductis, alteris sepala subaequantibus; sepalis lateralibus liberis, aequilateralibus, lanceolatis, acutis, 8 mm longis, late carinatis, glabris; placentis basilaribus.

Type. Pubescent, frequent in wet hummocks, Camp Savanna, Campo Grande, alt. 1500 m, Cerro Sipapo (Paráque), 10 Dec 1948, Amazonas, Venezuela, *Bassett Maguire & Louis Politi 27581* (holotype NY, isotype US).

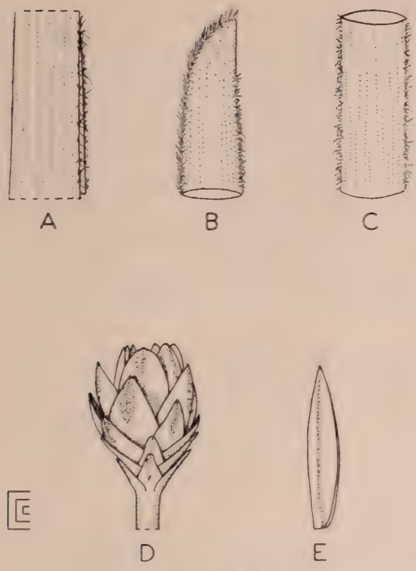
Distribution. Known only by the type collection.

64. Xyris araracuarae Maguire & Smith, sp. nov. Fig. 20, A–F.

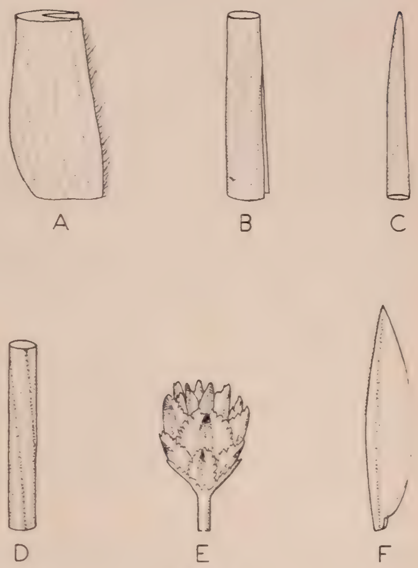
Herbae acaules, subbulbosae; foliis 15–20 cm longis; vaginis 5 cm longis, sulcatis, rubescentibus, basi abrupte orbiculari-dilatatis et atro-castaneis, intus longe denseque ciliatis, alibi glabris; laminis tortuosis, acuminatis, 0.7 mm latis, ex sicco irregulariter sulcatis, margine haud incrassatis, glabris; scapo 30 cm alto, 0.7 mm diametro, tereti, sublaeve; vagina scapi eis foliorum simili, brevissime laminata; spica late ellipsoidea, dein ex sicco obovoidea, 8 mm longa, submultiflora; bracteis ellipticis, late rotundatis, pallidis, margine tenuibus laceratisque, area dorsali magna angusta laeve viridi praeditis, basilaribus valde reductis, alteris sepala superantibus; sepalis lateralibus liberis, aequilateralibus, lanceolatis, acutis, 6 mm longis, anguste carinatis, ad apicem versus brevissime ciliatis; placentis perjuvenilibus ignotis.

Type. Frequent in scrub savanna, Araracuara, Río Caquetá, 5 Sep 1959, Amazonas, Colombia, *Bassett Maguire, C. K. Maguire & A. Fernández 44132* (holotype NY, isotype US).

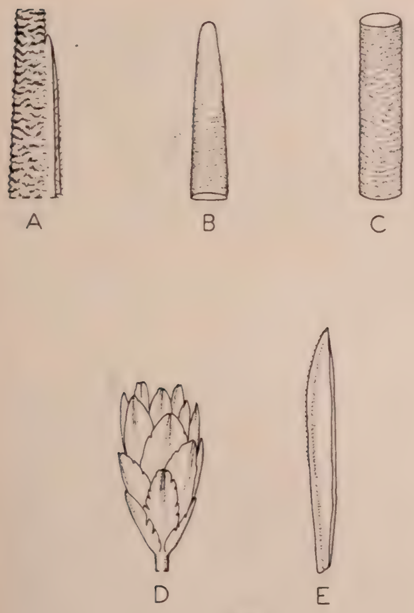
Distribution. Known only by the type collection.



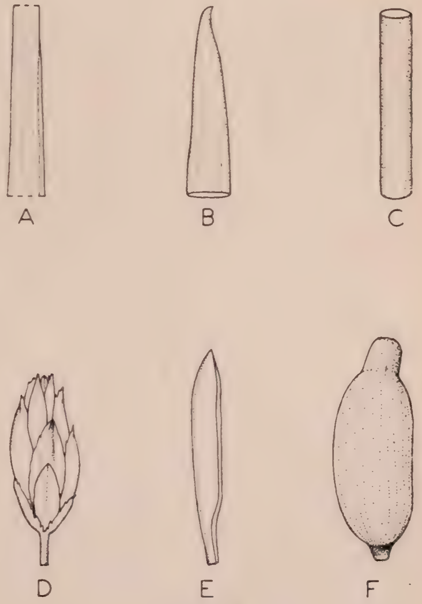
19



20



21



22

FIG. 19. *Xyris pratensis.* A, sheath apex, × 5. B, blade apex, × 5. C, scape section, × 5. D, spike, × 2. E, sepal, × 3. FIG. 20. *Xyris araracuarae.* A, sheath base, × 5. B, sheath apex, × 5. C, blade apex, × 5. D, scape section, × 5. E, spike, × 2. F, sepal, × 5. FIG. 21. *Xyris carinata.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 2.5. E, sepal, × 5. FIG. 22. *Xyris yutajensis.* A, sheath apex, × 7.5. B, blade apex, × 7.5. C, scape section, × 7.5. D, spike, × 2. E, sepal, × 5. F, seed, × 50.

65. Xyris carinata Maguire & Smith, sp. nov. Fig. 21, A–E.

Herbae acaules, cespitosae; foliis lineari-ensiformibus, ad 15 cm longis, transverse rugulosis, rubescentibus; vaginis 3–4 cm longis, sulcatis, apice minutissime ligulatis et cum laminis confluentibus, basi triangulari-auriculatis; laminis 1 mm latis; scapo 25–30 cm alto, 0.5 mm diametro, tereti, ruguloso; vagina scapi subfoliacea, breviter laminata; spica ellipsoidea, dein ex sicco obovoidea, 8–10 mm longa, pauciflora; bracteis oblongo-ellipticis, rotundatis, atris, apice carinatis et area dorsali parva angusta praeditis, basilaribus valde reductis, alteris sepala superantibus; sepalis lateralibus liberis, aequilateralibus, linearibus, acutis, 7 mm longis, anguste carinatis, ad apicem versus brevissime ciliatis; placentis basilaribus, elongatis.

Type. Flowers yellow, occasional in Bonnetia-grass savanna, summit Cerro Guanay, Caño Guaviarito, alt. 1800 m, Río Manapiare, Río Ventuari, 4 Feb 1951, Amazonas, Venezuela, *B. Maguire, K. D. Phelps, C. B. Hitchcock & G. Budowski 31773* (holotype NY, isotype US).

Distribution. Known only by the type collection.

66. Xyris malmeana L. B. Smith, Bol. Inspet. Fed. Obras Contra Secas, Rio. **10**: 126. 1939.

X. glabrata (Seubert) *Grisebach sensu Grisebach, Fl. Brit. W. Ind. 525. 1864*, non *X. savannensis β glabrata* Seubert.

Type. Open sandy soil, 2 km south of Vigia, Pará, Brazil, *Drouet 2136* (GH).

Distribution. Trinidad, Suriname (Tafelberg), northern Brazil (Amapá, Guaporé, Pará).

67. Xyris cuatrecasana Idrobo & Smith, Caldasia **6**: 244. *f. 30*. 1954.

Type. Circasia, márgenes del Vaupés, alt. 200 m, 9 Oct 1939, Vaupés, Colombia, *J. Cuatrecasas 7155* (holotype F).

Distribution. Known only by the type collection.

68. Xyris yutajensis Maguire & Smith, sp. nov. Fig. 22, A–F.

Herbae acaules, cespitosae; foliis lineari-ensiformibus, 5–7 cm longis, sublaevibus; vaginis ca. 1 cm longis, apice eligulatis et cum laminis confluentibus, ad basin versus gradatim latioribus, intus dense ciliatis; laminis 1–1.5 mm latis, glabris, margine haud incrassatis; scapo 10–22 cm alto, 0.5 mm diametro, subtereti, multicostato, glabro; vagina scapi eis foliorum simili, apiculata; spica anguste ovoidea, acuta, ad 10 mm longa, submultiflora; bracteis ellipticis, subacutis, tenuibus, area dorsali angusta laeve viridi praeditis, basilaribus valde reductis, alteris sepala subaequantibus; sepalis lateralibus liberis, aequilateralibus, lanceolatis, acutis, 5.5 mm longis, angustissime carinatis, glabris; placentis basilaribus.

Type. Flowers yellow, perennial herb on wet rocks and banks, frequent in small savanna and along left fork of Caño Yutaje, alt. 1250 m, Serranía Yutaje, Río Manapiare, 12 Feb 1953, Amazonas, Venezuela, *Bassett Maguire & C. K. Maguire 35206* (holotype NY, isotype US).

Distribution. Known only by the type collection.

69. Xyris lacerata Pohl ex Seubert in Martius, Fl. Bras. 3^1: 216. *pl. 26*. 1855.

Type. Goiás, Brazil, *Pohl.*

Distribution. Widely distributed, Colombia and Venezuela to Peru and central Brazil, to alt. 1500 m. Common in Guayana usually in savannas at low altitudes. Venezuelan records follow. VENEZUELA. Bolívar: Ciudad Píar, *Maguire, Wurdack & Bunting 35834;* Hato la Vergareña, Río Chiguirete, 11 Oct 1954, *Wurdack & Guppy 20;* morichal east of Río Orinoco, between Río Horeda and Cerro Gavilan, *Wurdack & Monachino 39951, 39952.* Amazonas: Esmeralda, *Tate 184* (NY), *263* (NY), *Croizat 115* (NY, VEN), *Steyermark 57865* (NY); Sanariapo, *Steyermark 58474* (NY).

70. Xyris subglabrata Malme, Bull. Torrey Club **58**: 322. 1931.

Type. In swampy ground, Grand Savanna, alt. 325 ft, Esmeralda, Amazonas, Venezuela, *G. H. H. Tate 303* (holotype NY).

Distribution. Known only by the type collection.

71. Xyris paraensis Poeppig in Kunth, Enum. Plant. **4**: 9. 1843.

Type. Pará, Brazil, *Poeppig* (B, syntype, US photo no. 5758).

Distribution. British Guiana, Suriname (Tafelberg, *Maguire 24203*), Amazonas and Pará, Brazil.

72. Xyris savanensis Miquel, Linnaea **18**: 605. 1844.

Type. Suriname, *Focke 1022.*

Distribution. Widespread as a wet savanna plant, Colombia and Venezuela to Peru, southern Brazil, Paraguay, and northern Argentina. In Guayana common in savannas at low altitudes, occasionally to 1200 m.

BROMELIACEAE [8]

Pitcairnia caricifolia var. **macrantha** L. B. Smith, var. nov.

Florifera 9 dm alta; bracteis florigeris pedicellis infimis aequantibus, quam reliquis brevioribus; sepalis acutis, 27 mm longis, rubro-aurantiacis; petalis 6 cm longis, ligula bidentata praeditis.

Type. Terrestrial, locally abundant on shaded rocky banks of black-water caño from Cerro Aracamuni on left bank of Río Siapa just above Raudal Gallineta (about 115 river km from mouth), alt. 130–140 m, Amazonas, Venezuela, 23 Jul 1959, *J. J. Wurdack & L. S. Adderley 43601* (holotype US).

The flowers of var. *macrantha* are much larger than those of the typical variety and the floral bracts are relatively smaller.

Pitcairnia patentiflora var. **armata** L. B. Smith, var. nov.

Florifera 2 m alta; foliis 14 dm longis, laminis 4 cm latis, basin versus paulo angustatis, omnino laxe serrulatis; sepalis ad 27 mm longis.

Type. Terrestrial, locally occasional in scrub forest on sandstone dome on right bank of Río Siapa just below Raudal Gallineta (about 110 river km from

---

[8] By Lyman B. Smith.

mouth), alt. 600–700 m, Amazonas, Venezuela, 21 Jul 1959, *J. J. Wurdack & L. S. Adderley 43565* (holotype US).

This variety differs from variety *macrantha* in its completely serrulate leaf-blades.

Navia barbellata L. B. Smith, sp. nov. Fig. 24, a–d.

Humilis; caule simplici, erecto vel adscendenti, ultra 25 cm longo, basibus foliorum vetustorum dense vestito; foliis vivis plurimis, apice caulis rosulatis, patentibus, 20 cm longis, fragilis, vaginis late ovatis, brevibus, integris, laminis ligulatis, acuminatis pungentibusque, basi paulo contractis, ad 18 mm latis, dense rubro-serrulatis, in axillis spinarum albo-barbellatis, alibi glabris, supra basin versus linea mediana pallida pictis; scapo gracili, 1 cm longo; inflorescentia simplici, subglobosa, pauciflora; bracteis florigeris exterioribus subfoliaceis, flores multo superantibus, interioribus acutis, integris, glabris, sepala subaequantibus; sepalis liberis, lanceolatis, obtusis cucullatisque, 20 mm longis, aurantiacis, posterioribus anguste alato-carinatis; petalis pallido-flavis (! Tillett).

Type. Upper Mazaruni River Basin, Kako River, British Guiana, alt. ca 1220 m; leaves medium green with red spines and white hairs along margin, very stiff and brittle; bracts of inflorescence orange-red; perianth yellowish-white; locally dominant on vertical cliff faces, main peak of Karowtipu, 29 Sep 1960, *S. S. & C. L. Tillett 45557* (holotype NY).

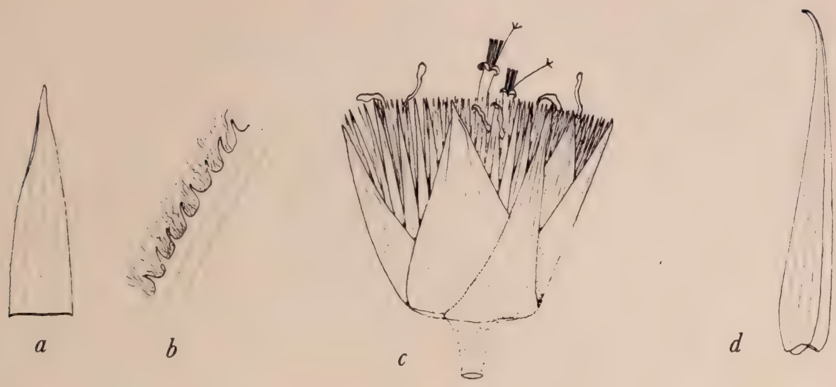
Because of its blunt cucullate sepals *Navia farinacea* appears to be related to *N. latifolia* L. B. Smith, but its leaves are glabrous except for the barbellate spine-axils instead of being cretaceous beneath like the latter.

Navia gracilis L. B. Smith, sp. nov. Fig. 27, a–d.

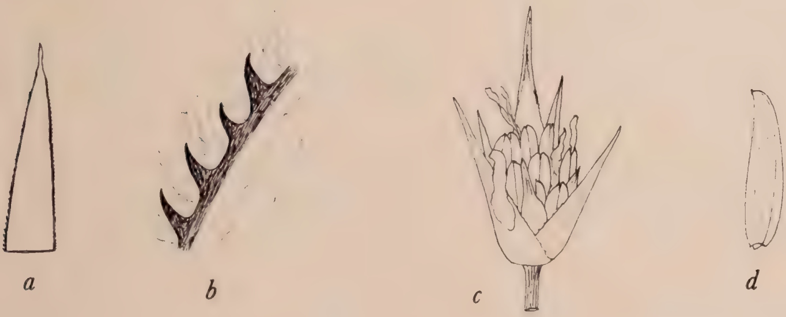
Florifera ad 2 m alta; foliis ad 75 cm longis, vaginis quam laminis laevioribus et brunneo coloratis sed latitudine vix distinctis, parvis, subinermibus, dissite obscureque lepidotis, laminis linearibus, acuminatis, pungentibus, 2 cm latis, tenuiter denseque nervatis, basi excepta subtus glabris, supra adpresse cinereo-lepidotis, spinis atris sursum curvatis 2 mm longis laxe armatis; scapo erecto, basi 15 mm diametro, glabro, dense minuteque rubro-maculato; scapi bracteis erectis, serrulatis, infimis subfoliaceis, internodia multo superantibus, supremis late triangularibus, parvis, quam internodiis multo brevioribus; inflorescentia ample laxeque tripinnatim paniculata, glabra; axi recto; bracteis primariis supremis scapi similibus, quam basibus sterilibus ramorum multo brevioribus; ramis subpatentibus ad 28 cm longis apice divisis, e basi 2/3 sterilibus; bracteis secundariis eis florigeris similibus; spicis gracilibus, leviter arcuatis, cylindricis, breviter stipitatis, 4–9 cm longis, 1 cm diametro, basi excepta densis, multifloris; bracteis florigeris erectis, latissime ovatis, apiculatis, 5 mm longis, sepala subaequantibus, pallidis, rubro-punctatis, crassis, verisimiliter carnosis, hyalino-marginatis; floribus subsessilibus; sepalis liberis, late ellipticis, subobtusis, 5 mm longis, posterioribus late alato-carinatis; petalis late rotundatis, 7 mm longis, albis, ex sicco flavis; staminibus inclusis; ovario omnino supero.

Type. Terrestrial, frequent in sabanita 1 km east of Maroa, Río Guainía, alt. 130 m, Amazonas, Venezuela, 1 Jul 1959, *J. J. Wurdack & L. S. Adderley 43275* (holotype US).

This species is closely related to *N. hohenbergioides* but differs in its more slender spikes, smaller flowers, and densely lepidote upper surface of the leaves and scape-bracts.



23



24

FIG. 23. *Navia splendens* (*Tillett 45841*). a, apex of leaf, × 0.5; b, margin of leaf, × 5; c, inflorescence, × 0.5; d, posterior sepal, × 1. FIG. 24. *Navia barbellata* (*Tillett 45557*). a, apex of leaf, × 0.5; b, margin of leaf, × 5; c, inflorescence, × 0.5; d, posterior sepal, × 1.

Navia splendens L. B. Smith, sp. nov. Fig. 23, a–d.

Caulescens ad 2 dm (! Tillett); caule 15 mm diametro, basibus foliorum vetustorum dense obtecto; foliis in rosula terminale ad 37 cm longis, vaginis brevibus, inconspicuis, laminis ligulatis, acuminatis pungentibusque, basi paulo contractis et roseis, ad 35 mm latis, obscurissime punctulato-lepidotis, dense serrulatis, axillis spinarum albo-barbellatis; scapo minimo; inflorescentia hemisphaerica, densissime corymbosa, multiflora; bracteis exterioribus late ovatis, acuminatis, sepala subaequantibus, serrulatis, lepidibus albis stellatis adpressis dense obtectis; bracteis florigeris angustissime triangularibus, sepala subaequantibus, subchartaceis, glabrescentibus, minute serrulatis; floribus sessilibus, flavis; sepalis liberis, anguste triangularibus, longe acuminatis, 45 mm longis, subcoriaceis, nervatis, integris, mox glabris, posterioribus late alato-carinatis; petalis quam sepala paulo longioribus, apice paulo spiraliter recurvatis; staminibus styloque exsertis; ovario supero.

Type. Upper Mazaruni River Basin, top of Utschi Falls, Kamarang River, British Guiana, alt. 820 m; stem to 2 dm, clothed in old blackened leaf-bases; leaves medium green, shading to yellow and red above, pink at very base, brittle; bracts of inflorescence the same but with white tomentum at base; floral bracts, perianth, filaments and style light yellow, anthers orange; locally common on rock faces, 28 Oct 1960, *S. S. & C. L. Tillett 45841* (holotype NY).

In general aspect *Navia splendens* closely resembles *N. lopezii* L. B. Smith, but is quickly distinguished by its densely serrulate leaves.

Bromelia tubulosa L. B. Smith, sp. nov. Fig. 28, a–b.

Foliis ad 1.5 m longis; vaginis subovatis, 7 cm longis, basin versus lepidibus linearibus pallide brunneis vestitis, dense recurvato-serratis; laminis linearibus, acuminatis, basin versus attenuatis sed haud petiolatis, ad 3 cm latis, sparse obscureque brunneo-lepidotis, spinis antrorsis retrorsisque 4 mm longis laxe armatis; inflorescentia corymbosa, subpauciflora, 6 cm diametro, inter folia rosulae nidulanti, petalis inclusis dense brunneo-lepidotis; bracteis primariis subfoliaceis; bracteis florigeris oblongis, 4 cm longis, ovaria superantibus, apice serratis; sepalis ad 2 cm longis, in tubum cylindricum irregulariter peralteque connatis, apice irregulariter lobatis serratisque; petalis linearibus, obtusis, 4 cm longis, stamina longe superantibus, albis; tubo filamentorum 20 mm longo; ovario subcylindrico, ad 25 mm longo.

Type. Terrestrial, occasional in forest on crystalline laja on right bank of Río Siapa 8 km below Raudal Gallineta (about 100 river-km from mouth), alt. 200–300 m, Amazonas, Venezuela, 20 Jul 1959, *J. J. Wurdack & L. S. Adderley 43525* (holotype US).

The highly connate sepals of *Bromelia tubulosa* present the most extreme case of this character in the genus, so that nothing else is required to distinguish the species. However, it would seem most closely allied to *B. fosteriana* L. B. Smith of Suriname.

Aechmea egleriana var. **major** L. B. Smith, var. nov.

Florifera ultra 6 dm alta; foliis ad 11 dm longis; vaginis amplis, ultra 3 dm longis; inflorescentia ample tripinnatim paniculata, 37 cm longa.

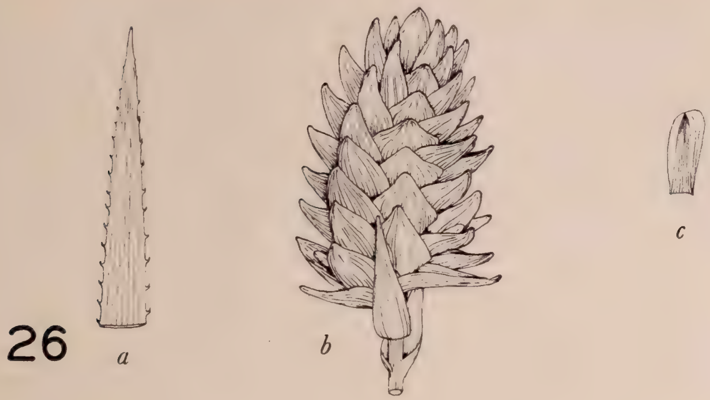
Type. Epiphyte, along Río Siapa between Río Casiquiare and mouth of Río Hechimoni, alt. 120 m, Amazonas, Venezuela, 25 Jul 1959, *J. J. Wurdack & L. S. Adderley 43613* (holotype US).

As its name implies, variety *major* differs from the typical variety in being larger in all its parts.

Aechmea (Purpurospadix) pallida L. B. Smith, sp. nov. Fig. 26, a–c.

Acaulis, stolonibus brevibus suberectis procreans; foliis ca 20 in rosula, extimis valde reductis, alteris ad 52 cm longis, erectis, inflorescentiam subaequantibus, coriaceis, subtus dissite minuteque lepidotis, vaginis late ellipticis, ca 15 cm longis, purpureis, laminis anguste triangularibus, pungentibus, ad 7 cm latis, spinis patentibus 1.5 mm longis sublaxe armatis, nullo modo canaliculatis; scapo erecto, glabro, apice 4 mm diametro; scapi bracteis erectis vel suberectis (supremis), internodia subduplo superantibus, ovatis, acuminatis, integris, subcoriaceis, nervatis, albis, punctulato-lepidotis; inflorescentia simplicissima, strobiliformi, 8 cm longa, 5 cm diametro, multiflora; bracteis florigeris patentibus sed earum basibus dense imbricatis, ovatis, late acutis, eis scapi similibus, flores multo superantibus, integris; floribus sessilibus; sepalis liberis, oblongis, obtusis inermibusque, paulo asymmetricis, 11 mm longis, posterioribus cum ovario alatis; petalis imperfecte cognitis, verisimiliter nudis, albis; ovario subgloboso; ovulis longe caudatis.

Type. Upper Mazaruni River Basin, Partang River, Merumé Mountains, British Guiana, alt. 824 m; epiphyte on tree trunk 2 m from ground; leaves deep



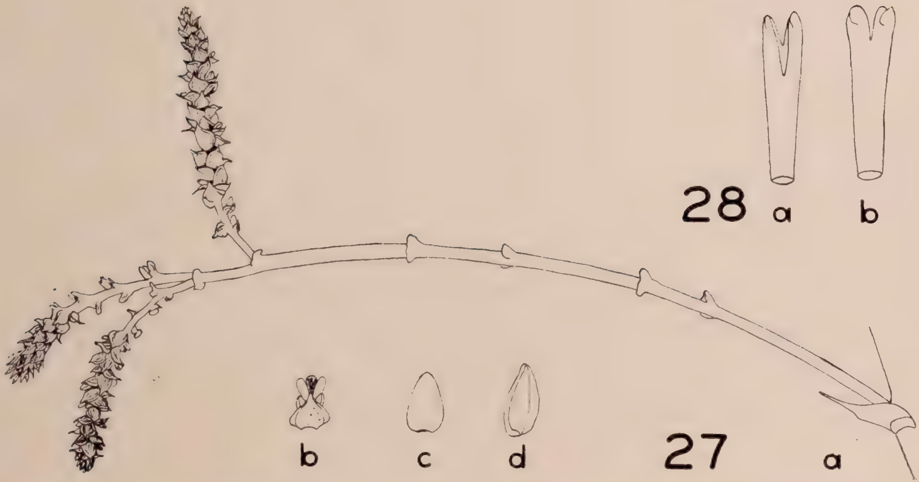


FIG. 26. *Aechmea pallida* (*Tillett & Boyan 44859*). a, apex of leaf, × 0.5; b, inflorescence, × 0.5; c, sepal, × 1. FIG. 27. *Navia gracilis* (*Wurdack & Adderley 43275*). a, branch of inflorescence, × 0.5; b, floral bract and flower, × 1; c, anterior sepal, × 2; d, posterior sepal, × 2. FIG. 28. *Bromelia tubulosa* (*Wurdack & Adderley 43525*). a and b, opposite sides of calyx, × 1.

brown at base within, strongly cupped and incurved above the base; inflorescence bracts white overlaid with pink near tip, margins blue with white band between pink and blue, tip white; young fruit white with greenish-blue tip; only one seen; wet forest above first cliffs along trail from Porkknocker Camp 3, at fork of Partang River, to Merumé Mountain, 9 Jul 1960, *S. S. & C. L. Tillett & R. Boyan 44859* (holotype NY).

PIPERACEAE [9]

Piper wurdackii Yuncker, sp. nov.

Frutex parvus, internodiis superis glanduloso-granulosis, foliis late ellipticis apice abrupte arcteque plus minusve falcatim acuminatis basi subaequilateraliter rotundatis cordulatis supra glabris subtus ad venas plus minusve adpresse puberulis ca. ad medium pinnatim venosis nerviis utrinque 8–9, petiolo ad laminam vaginato-alato; spicis valde apiculatis, bracteis triangulari-subpeltatis margine conferte fimbriatis, drupa oblonga angulata glabra apice depresso-truncata, stigmatibus parvis sessilibus.

---

[9] By T. G. Yuncker.

A branching subshrub 1–2 m high; upper internodes stout, up to 12 cm long, glabrous, glandular-granular and dark when dry. Leaves broad-elliptic, the apex abruptly and narrowly somewhat falcately acuminate, the base subequilaterally rounded, cordulate, glabrous above, the nerves beneath appressed-puberulent, glabrescent, the midrib glabrate toward the base, appressed-puberulent upward, 11–14.5 cm wide and 20–25 cm or more long, pinnately nerved to about the middle, the nerves 8 or 9 on each side, subequidistantly spaced with the exception of the lowermost 3 or 4 pairs and the uppermost slightly more distant pair, prominent beneath, with conspicuous cross-connecting-anastomosing nervules, the areolas strongly angular as viewed by transmitted light, drying green above, brown beneath, chartaceous, translucent, pellucid-dotted; petiole stout, 2.5–4 cm or more long, glabrous, vaginate-winged to the blade, the wings deciduous. Spikes 4 mm thick and 9.5 cm long, strongly apiculate, the point 2–5 mm long, puberulent, the peduncle stout, about 1.5 cm long, glabrous, the bracts triangular-subpeltate, densely marginally fringed, the drupes annularly arranged, oblong, laterally compressed and angular, glabrous, with truncate-depressed apex and small, sessile stigmas.

Type. Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, locally frequent in talus forest between Camps 3 and 4, alt. 900–1000 m, 8 Nov 1957, *B. Maguire, John J. Wurdack & Celia Maguire 42007* (holotype, NY).

The leaf shape and size, numerous nerves more or less puberulent beneath, abruptly acuminate apex and apiculate spikes characterize this species. It bears considerable resemblance to *P. glabrescens* (Miquel) C. de Candolle, but differs in having more numerous lateral nerves, stouter and longer spikes, etc. It is named for one of the collectors.

Piper subduidaense Yuncker, sp. nov.

Suffrutex, caule glabro; foliis ellipticis vel elliptico-ovatis apice acuminatis basi subaequilateraliter acutis supra glabris subtus crispo-puberulis conferte ciliatis glanduloso-punctatis ad medium pinnatim venosis, nerviis utrinque 5–6; bracteis triangulari-subpeltatis luteo-fimbriatis, drupa glabra glanduloso-punctata obpyramidali-trigona apice depresso-truncata, stigmatibus sessilibus.

A nodose, branching, soft-wooded shrub up to 1.5 m high; stem glabrous, the upper internodes 3–8 cm long. Leaves elliptic or elliptic-ovate, the apex acuminate, the base subequilateral, acute, one side slightly shorter at the petiole, the upper leaves 5.5–7 cm wide and 12–16 cm long, the lower leaves up to 11 cm wide and 21 cm long, glabrous above, crisp-puberulent beneath with the nerves more densely so, prominently ciliate, glandular-dotted, pinnately nerved to about the middle, the nerves 5 or 6 on each side, with cross-connecting-anastomosing nervules, drying chartaceous, translucent, pellucid-dotted; petiole glabrous, 5 mm long on the upper leaves and vaginate below the middle, 2–3 cm long on the lower leaves and vaginate-winged to about the middle. Spikes 3 mm thick and up to 10 cm long, the peduncle up to 2.5 cm long, puberulent near the spike, glabrous below, the bracts triangular-subpeltate, yellow-fringed, the ovary globose-ovoid, the fruit glabrous, glandular-dotted, obpyramidal-trigonous, with truncate-depressed apex and sessile stigmas.

Type. Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, frequent on escarpment slopes above Camp 5, alt. 1600–1700 m, 17 Nov 1957, "suffrutescent, to 1.5 m tall; spikes erect, green," *B. Maguire, J. J. Wurdack & Celia Maguire 42047* (holotype, NY).

The plant parts glabrous with the exception of the puberulent lower leaf surface and ciliate margin, and rather long peduncle and obpyramidal-trigonous fruits are distinctive features of this species. The name indicates its close relationship with *P. duiadense* Trelease, from which it differs in its major lateral nerves originating from the midrib below the middle.

Piper neblinanum Yuncker, sp. nov.

Frutex parvus glaber ramosus; foliis lanceolatis apice subfalcatim acuminatis basi ad petiolum subaequali cuneatim decurrentibus totis pinnatim venosis, nerviis utrinque 4–6, subtus conferte glanduloso-punctatis; bracteis arcte triangulari-subpeltatis margine conferte luteo-fimbriatis, drupa obpyramidali-trigona apice depresso-truncata.

A small glabrous branching shrub, 1 m high; upper internodes slender, 1–3 cm long. Leaves lanceolate, the apex subfalcately acuminate, the base subequilateral, cuneate-decurrent, 2–3 cm wide and 10–12 cm long, pinnately nerved throughout, the nerves 4–6 on each side, submarginally loop-connected, with obscure cross-connecting-anastomosing nervules, strongly glandular-dotted beneath, drying chartaceous, green, paler beneath, translucent, pellucid-dotted; petiole 2–5 mm long, vaginate at the base. Spikes becoming 3–4 mm thick and 4 cm long when mature, the peduncle 10–13 mm long, the bracts narrowly triangular-subpeltate, strongly yellow-fringed, the ovary ovoid, with acute apex and small stigmas, the fruit obpyramidal-trigonous, glabrous, with truncate-depressed apex.

Type. Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, in *Clusia* scrub forest just south of Camp 3, alt. 700 m, 14–16 Nov 1957, *B. Maguire, J. J. Wurdack & Celia Maguire 42082* (holotype, NY).

The glabrous parts, narrowly lanceolate leaves, few nerves, and obpyramidal-trigonous fruits are characters that distinguish this species. It differs from *P. nigrispicum* C. de Candolle of northern Brazil, which it resembles somewhat, in its narrower, more strongly glandular-dotted leaves, and usually longer peduncles. The name is derived from that of the region where it was collected.

Peperomia neblinana Yuncker, sp. nov.

Herba sat parva diffusa subdichotoma ramosa rhizomatosa, caule minute hirtulo; foliis alternis late ovatis apice rotundatis basi truncatis ad petiolam abrupte subacutis obscure hirtulo-glabrescentibus ciliatis palmatim 5-nerviis, petiolo minute hirtulo; spicis terminalibus dissite florigeris, pedunculo glabro, drupa subturbinato-cylindrica apice mammiforme, stigmate apicali.

A rather small, spreading, subdichotomously branched, rhizomatous herb, rooting from the lower nodes; stem minutely hirtellous, 1–2 mm thick when dry, the leafy branches ascending to 10 cm. Leaves alternate, broadly ovate, with rounded apex and truncate base abruptly subacute at the petiole, obscurely hirtellous-glabrescent, ciliolate, the apex bristly so, palmately 5-nerved, the slender nerves and midrib branched upward, variable in size, 7–8 mm wide and 1–2 cm long, drying thin and membranous, translucent; petiole 5–10 mm long, minutely hirtellous. Spikes terminal, loosely flowered, 1 mm thick and up to 2 cm long, the peduncle about 5 mm long, glabrous, the bracts round-peltate, the fruit about 1 mm long, basally immersed, subturbinate-cylindrical, apically mammiform with apical stigma.

Type. Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, locally abundant on fallen logs on escarpment slopes above Camp 3, alt. 1600–1700 m, 17 Nov 1957, *B. Maguire, J. J. Wurdack & Celia Maguire 42050* (holotype, NY).

This species appears to be closely related to *P. panamensis* C. de Candolle, but differs in its mostly larger and broadly ovate leaves which are membranous when dry.

LAURACEAE [10]

A portion of the tropical American representatives of the family has been revised in minute detail by Dr A. J. G. H. Kostermans.[11] The two largest genera, *Nectandra* and *Ocotea,* have not had monographic consideration since the publication by Mez [12] in 1889. Doctor Kostermans' revisions were followed by an historical survey of the family [11] and later a summary.[11] The latter is extremely valuable in that the literature pertinent to the subgeneric rank is brought together for the first time in seventy years. He has examined generic characters in the light of his decades of field work in Malaysia and attempted a re-evaluation of their importance. In spite of this, however, it is apparent that further anatomical and ecological surveys are essential before we can accept without reservation Kostermans' conclusions in their entirety.

Because of this reservation, I have maintained as separate taxa the two controversial genera, *Nectandra* and *Ocotea,* combined by Dr. Kostermans under the single genus, *Ocotea.* Eventually, a detailed, monographic study will be made of this group. Possibly future examination of herbarium material not now available, together with field observations and anatomical study, may show them to represent opposite extremes of a single, variable genus. Until such time, despite an overlapping of characteristics in some plants, i.e., the occasional indeterminate position of the anther cells which appear to be in obscure arc-formation, or approach superposition in two distinct planes, they are considered as separate genera. I am maintaining also for the present the generic status of *Pleurothyrium,* which Kostermans has reduced, as well as *Nectandra,* to subgeneric rank under *Ocotea.* The always present glands at the base of all three outer cycles of stamens, the consistent shape of the anthers, and the location of their cells present more clear-cut and recognizable distinctions than some of the rather more obscure characteristics used for separating other genera of the family. Lucille E. Kopp [13] has not accepted the American species of *Phoebe* with cylindric fruiting pedicel as congeneric with *Persea,* a reduction suggested by Kostermans. To date, I do not see the wisdom of incorporating those species of *Phoebe,* with thickened fruiting pedicels, with the genus *Cinnamomum,* bearing fruit subtended by disklike cupules, which is confined wholly to the tropics of eastern Asia.

In the main, only Guayana Highland collections are cited in the present survey. However, species of adjacent floras which appear infrequently on the fringe of the Guayana area are included; conversely, species typical of areas beyond the Guayana range but found occasionally in the latter are noted.

---

[10] By Caroline K. Allen (under National Science Foundation Grant NSF GB2).

[11] Kostermans, A. J. G. H. Revision of the Lauraceae I. Meded. Bot. Mus. Utrecht **37**: 719–757. 1936. II. **42**: 500–609. 1937. III. **46**: 56–129. 1938. V. **48**: 834–931. 1938.

——. A historical survey of Lauraceae. Jour. Sci. Res. Indonesia **1**: 83–95; 113–127; 141–159. 1952.

——. Lauraceae. Communication (Pengumuman) of the Forest Research Institute, Indonesia **57**: 1–64. 1957.

[12] Mez, C. Lauraceae americanae. Jahrb. Bot. Gart. Berlin **5**: 1–556. 1889.

[13] See the genus *Persea,* below.

Aiouea benthamiana Mez, Jahrb. Bot. Gart. Berlin **5**: 48. 1889.

Aiouea brasiliensis γ glabriflora Meissner in DC. Prodr. **15**^{1}: 83. 1864, quoad *Spruce 2414*.

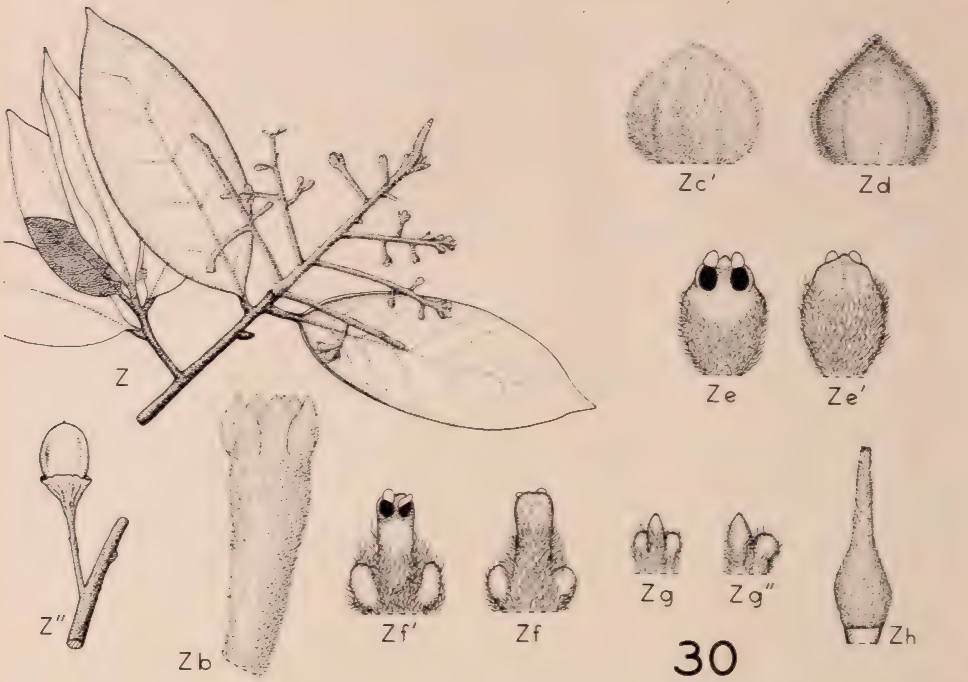
Type. Prope San Gabriel de Cachoeira, ad Rio Negro, Amazonas, Brazil, *Spruce 2414* (isotype, fl. NY).

Distribution. Tree or shrub growing along the Rio Negro and its tributaries in Brazil and possibly extending into Colombia, with a single collection noted from eastern Brazil in the Amapá region. BRAZIL. Amapá: infrequent in riverine forest on right bank of Rio Amapari, Serra do Navio, *Cowan 38596* (fr. NY).

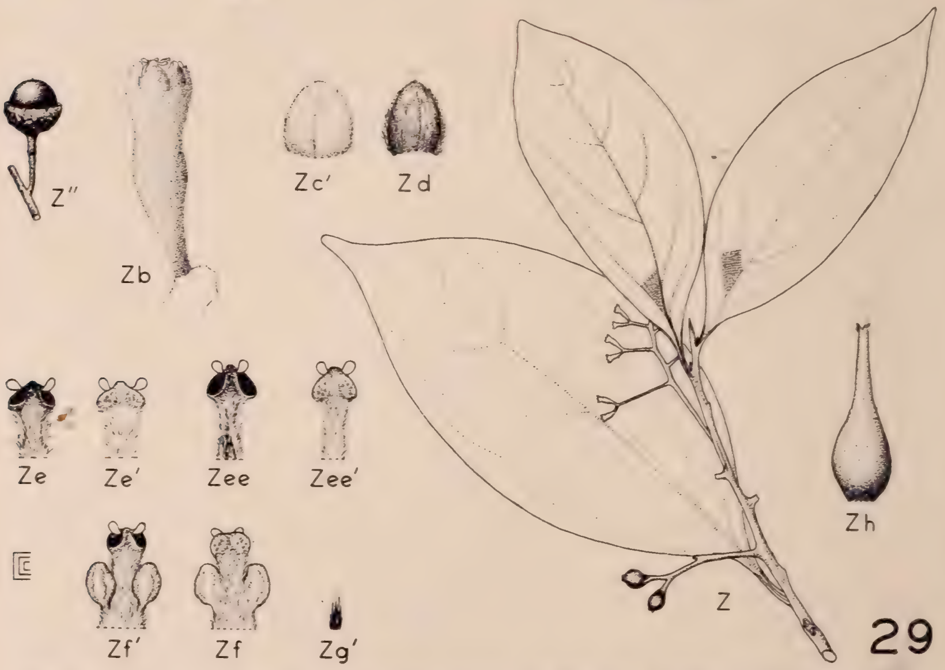
The species is distinctive for the very small, delicate, green or yellow flowers borne in dense clusters at the tips of reddish branchlets of much-branched panicles which are frequently longer than the shining, yellow-green leaves, these usually with undulate margins. According to the collector's note on the above-cited specimen, the fruit is ellipsoid, green, borne in a dark red cupule.

Aniba castanea C. K. Allen, sp. nov. Fig. 29.

Arbor gracilis ad 6 m alt., gemmis gracilibus anguste lanceolatis longo-acuminatis dense minuteque pallide subferrugineo-subsericeis, ramulis atro-brunneis subangulatis, mox striatis ± teretibus, subferrugineo-pubescentibus. Folia alternata, saepe ad apicem ramulorum opposita, petiolis satis robustis pubescentibus, mox glabrescentibus, atratis canaliculatis 6–12 mm longis et ad basim 3 mm latis, laminis utrinque glabris, juventute permembranaceis utrinque castaneis, mox subcoriaceis, supra opaca viridescentibus subtus pallide castaneo-brunneis ellipticis, (8–) 10–18 cm longis et (3–) 4–7 cm latis, ad basim attenuato-cuneatis saepe recurvatis et leviter decurrentibus, ad apicem attenuato-acuminatis, acumine ad 2 cm longo vel obtuse acuto, penninerviis, costa supra pallide castaneo-brunnea ± impressa, subtus concolor conspicue elevata, nervis ± 5-paribus, juventute tenuissimis inconspicuis utrinque concoloribus, mox subtus conspicue elevatis ad angulo 35° divergentibus, rete venularum juventute utrinque conspicuo mox supra obscuriori. Inflorescentia axillaris subterminalisque, ut videtur pauciflora, minute pubescens, anguste racemoso-paniculata, pedunculo ad 2 cm longo, ad (post anthesin) 7 cm longa et 2 cm lata. Flores ad 0.8–1 mm longi, minute pubescentes, pedicello gracili 0.3 mm longo; perianthio suburceolato, lobis ovatis ad 1 mm longis quam tubo crasso duplo longioribus; staminibus fertilibus pubescentibus ser I & II ad 0.7 mm longis, antheris late ovatis, locellis aliquantum parvis apicali-introrsis, connectivo inconspicuo producto, filamentis ± crassis quam antheris ± duplo longioribus, ser III subrotundatis ad 25 mm longis, locellis satis magnis extrorsis quam filamentis satis crassis triplo brevioribus, biglandulosis, glandulis ± ovatis stipitatis, ser IV abortivo ±0.5 mm longis, pubescentibus; gynoecio glabro ad 4.5 mm longo, ovario ± ovato-ellipsoideo glabro, stylum gracilem subaequanti, stigmate ± attenuato-inconspicuo. Infructescentia matura ? depauperata minute pubescens ad 4.5 cm longa. Fructus maturus? in sicco castaneus, oblongo-subrotundatus, obscure apiculatus, ad 12 × 10 mm, cupula in sicco atrato-brunnea cyathiformi glabrata minuto-verruculosa ad 10 mm longa, 15 mm diam. et 5 mm alt., pedicello ±5 mm longo et 2 mm lato subtenta.


Zc'
Zd
Ze
Ze'
Z
Z"
Zb
Zf'
Zf
Zg
Zg"
Zh

30


Z"
Zb
Zc'
Zd
Ze
Ze'
Zee
Zee'
Zf'
Zf
Zg'
Zh
Z

29

FIG. 29. *Aniba castanea* (*Z–Zh, Maguire 24616; Z" Maguire 24825*). Z, habit, flowering branchlet, × 0.5; *N.B.* two upper leaves young; upper surface right, lower surface left; lower leaf adult, upper surface. Zb, flower, × 5. Zc', tepal, ser I, dorsal, × 10. Zd, tepal, ser II, ventral, × 10. Ze, stamen, ser I, ventral, × 10. Ze', stamen, ser I, dorsal, × 10. Zee, stamen, ser II, ventral, × 10. Zee', stamen, ser II, dorsal, × 10. Zf, stamen, ser III, ventral, × 10. Zf', stamen, ser III, dorsal, × 10. Zg', staminodium, ser IV, dorsal, × 10. Zh, ovary, × 10. Z", fruit, × 0.5.

Type. Slender tree 6 m, Dabama forest in bottom of Arrowhead Basin, Tafelberg (Table Mountain) Suriname, 515 m, 3 Sep 1944, *Bassett Maguire 24616* (holotype, fl., y. fr. NY).

Distribution. A slender tree to 6 m known only from the type locality. SURINAME. Tafelberg (Table Mountain), high mixed Wallaba forest, km 25, *Maguire 24825* (fr. A, NY).

The species shows an apparent relationship with *A. jenmani* Mez from Demerara, the type of which (*Jenman 3949*) I have not seen. Dr Kostermans comments on the relationship between the latter and the Peruvian species *Endlicheria paradoxa* Mez, based on *Pearce s.n.* a flowering specimen not available at this time. Nor have I seen the Dutch Guiana number from Brownsberg (*B.W. 3328*), cited by Kostermans under the latter, but I strongly suspect that this may belong to *A. castanea*. *Lanjouw & Lindeman 2290,* sterile material from Dutch Guiana also referred to the Peruvian species, resembles and indeed may be conspecific with the new species from Tafelberg. The bark of the twigs of both yields a fragrance when bruised or cut.

Maguire 24825 was reported from fruiting material only as possibly *Aniba* or *Ocotea,*[14] flowering material being not then available.

Aniba percoriacea C. K. Allen, sp. nov. Fig. 31.

Arbor ad 15 m alt. et 20 cm diam., gemmis ut videtur ovoideis dense minuteque ferrugineo-tomentosis, ramulis juventute leviter sulcatis atro-ferrugineo-tomentosis, mox teretibus leviter striatis brunneo-tomentosis gradatim glabrescentibus. Folia magna, alternata, petiolis robustis brunneo-tomentosis valde striatis ad basim intumescentibus canaliculatis ad 15 mm longis et 3–4 mm latis, laminis percoriaceis utrinque glabris costis exceptis, supra olivaceo-viridibus subtus pallidioribus brunnescentibus, ellipticis, (9–10–) 20–26 cm longis et (3.5–) 6–10 cm latis, ad basim acutis vel obtusis saepe margine leviter recurvatis, ad apicem obtuse acuminatis, acumine ad 2 cm longo, vel obtusis acuto-obtusisve, penninerviis, costa robusta aliquantum flavescenti, supra inconspicua subtus plana ad basim leviter impressa conspicue elevata, nervis ±10-paribus supra tenuissimis subtus ± succulentibus leviter elevatis, ad angulo 67–70° divergentibus, rete venularum supra obscuro subtus succulenti leviter elevato. Inflorescentia axillaris subterminalisve, robusta, ferrugineo-tomentosa, racemoso-paniculata, pauciflora, ad 7 cm longa et 3 cm lata. Flores flavescentes fide coll., ad 10 mm longi, minute pubescentes, pedicellis robustis ad 4 mm longis; perianthio (in gemma) ± globoso, lobis subrotundatis ad 3 mm longis, quam tubo duplo brevioribus; staminibus fertilibus pubescentibus, ser I & II petaloideis ad 2.5 mm longis, antheris late ovatis, locellis parvis apicali-introrsis, connectivo parvo obtuso producto, filamentis obscuris quam antheris mergentibus triplo longioribus, ser III ad 2 mm longis antheris subquadratis, locellis conspicuis quam filamentis satis crassis leviter longioribus, biglandulosis, glandulis brevistipitatis, ser IV O; gynoecio dense pubescenti ad 5 mm longo, ovario ellipsoideo brevistipitato, stylo

---

[14] Allen, C. K. Bull. Torrey Club **75**: 317. 1948.

Fig. 30. *Aniba cinnamomiflora* (Z, Zb–Zh, *Maguire & Politi 28476*; Z″, *Maguire & Politi 28241*). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc′, tepal, ser I, dorsal, × 10. Zd, tepal, ser II, ventral, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze′, stamen, ser I & II, dorsal, × 10. Zf, stamen, ser III, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zg, staminodium, ventral, × 10. Zg″, staminodium, lateral, × 10. Zh, ovary, × 10. Z″, fruit, × 0.5.

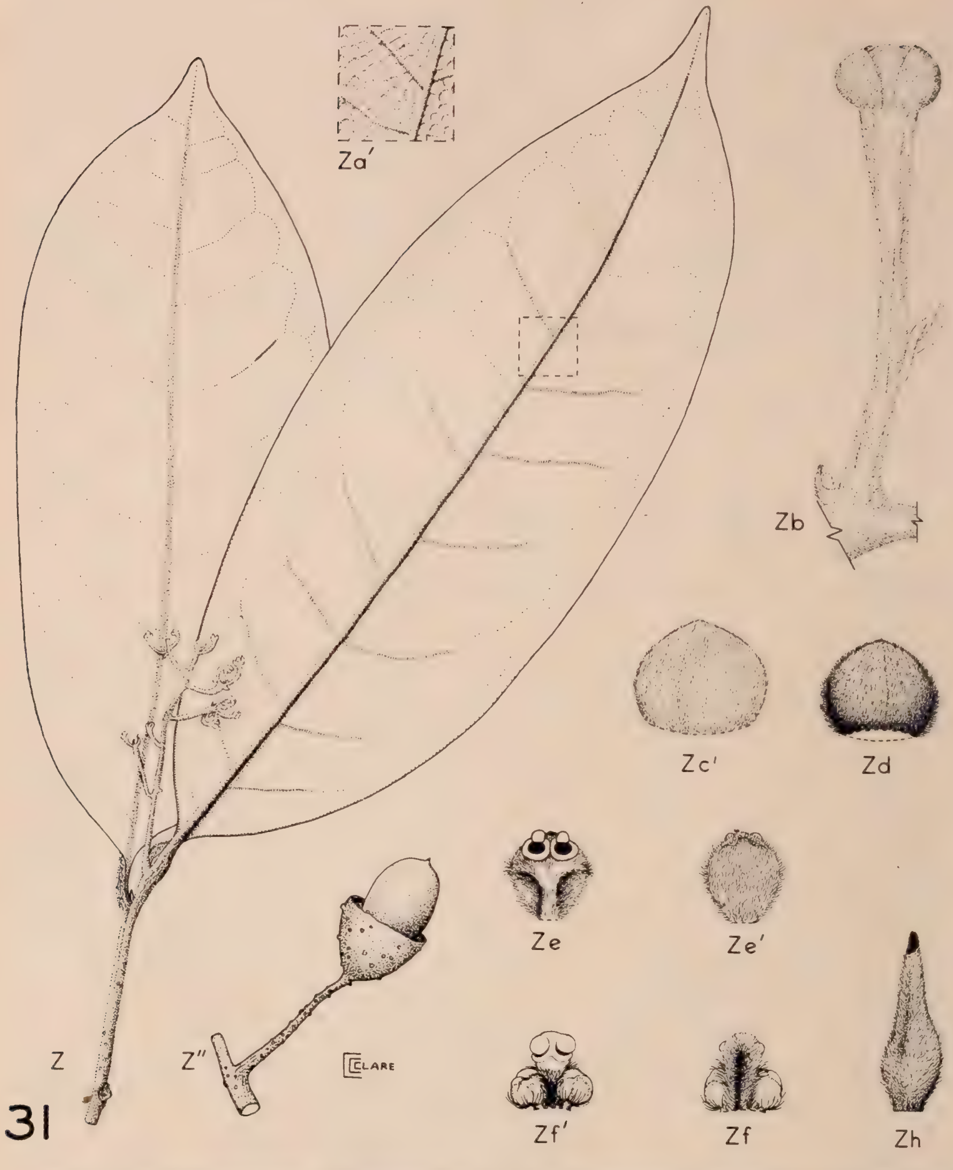


FIG. 31. *Aniba percoriacea* (*Maguire 24726*). Z, habit, flowering branchlet, × 0.5. Za′, leaf undersurface, portion enlarged, × 1. Zb, flower, tight bud, × 5. Zc′, tepal, ser I, dorsal, × 10. Zd, tepal, ser II, ventral, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze′, stamen, ser I & II, dorsal, × 10. Zf, stamen, ser III, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zh, ovary, × 10. Z″, fruit, × 0.5.

crasso subaequali, stigmate plano transverso inconspicuo. Infructescentia depauperata, minute pubescens, ad 6 cm longa. Fructus in sicco olivaceo-brunneus, ellipsoideus, apiculatus, ad 25 mm × 15 mm, cupula cyathiformi brunnescenti minute fulvo-verrucosa ad 15 mm longa, ±20 mm diam., et ±10 mm alt., subsessili vel ut videtur brevipedicellata.

Type. Tree to 15 m high, 20 cm diam., flower yellowish, between North Ridge

Creek and Augustus Creek, hill no. 1, Tafelberg, Suriname, 570 m, 13 Aug 1944, *Bassett Maguire 24726* (holotype fl., fr. NY; fr. A).

Distribution. A tree to 15 m with large, extremely coriaceous, elliptic leaves, the pale brownish under contrasting with the olive-green upper surface, known only from the type locality.

The nearest alliance seemingly is the new species *A. castanea,* another equally arresting species from Tafelberg, Suriname. The two are easily distinguished, however, by the dense, conspicuous reticulations of the leaves of the latter species which is smaller in every dimension. Examination of the flower structure shows no near relationship.

The type of this species also was reported (Allen, l. c.) as *Ocotea?* on the fruiting material alone at the Arnold Arboretum.

Aniba cinnamomiflora C. K. Allen, sp. nov. Fig. 30.

Arbor parva ad 2 m alt., gemmis ovoideis subferrugineo-pubescentibus ad apicem ± attenuatis, ramulis rubiginosis striatis aliquantum ferrugineo-pubescentibus mox cinereo-glabrescentibus subteretibus. Folia alternata suboppositave, petiolis robustis atro-brunnescentibus glabrescentibus canaliculatis, 10–12 mm longis et 3–4 mm latis, laminis supra glabris subtus glabrescentibus coriaceis, supra viridibus subtus opacis, ellipticis, (4–) 6–13 cm longis et (2–) 2.8–5.3 cm latis, margine recurvatis, ad basim acutis rotundatisve, ad apicem acutis vel subacuminatis, raro obtusis vel emarginatis, penninerviis, costa brunnea, supra leviter subtus conspicue elevata, nervis ±8-paribus utrinque ± inconspicuis, ad angulo 50–45° divergentibus, rete venularum obscure minuteque areolato. Inflorescentia terminalia robusta, ut videtur patenti-paniculata, ad 3.5–5 cm longa, utrinque dense adpresseque cinnamomeo-pubescens, pauciflora, subsessilis. Flores 4–5 mm longi, pedicello 1.5–2 mm longo aliquantum robusto; perianthio campanulato, lobis satis crassis late ovatis, ad 1.5 mm longis, tubo lobis aequali vel longiore; staminibus fertilibus pubescentibus, ser I & II ad 0.8 mm longis, antheris subrotundatis introrsis, connectivo anguste obtuso producto, filamentis crassis quam antheris brevioribus, ser III quam I & II leviter brevioribus biglandulosis, glandulis sessilibus, antheris ± apicali-extrorsis; gynoecio 1.8–2 mm longo, ovario subrotundato vel ovoideo pubescenti, ad apicem attenuato quam stylo robusto breviore, stigmate minute lobato. Infructescentia brevis et depauperata, glabrescens. Fructus viridis, ellipsoideus, ad 1.8 × 1.3 cm, cupula rubra, fide coll., cyathiformi tenui verruculosa, ad 12 mm longa, ad 15 mm diam., et ad 4–5 mm alt., stipite ad 5 mm longo, pedicello incrassato glabrescenti, ad 3 mm longo.

Type. Small tree 2 m, woodland in Caño Grande, Cerro Sipapo (Paráque), Amazonas, Venezuela, 1150 m, 20 Jan 1949, *Bassett Maguire & Louis Politi 28476* (holotype, fl. NY).

Distribution. Known only from the Cerro Sipapo region where it occurs along streams or near mountain summits at 1500–1800 m. VENEZUELA. Amazonas: near summit of West Mountain, Cerro Sipapo (Paráque), *Maguire & Politi 28121* (fl., fr. NY), infrequent at stream-side, upper Caño Negro, *28241* (fr. NY).

The smooth, extremely leatherly leaves with robust petioles, olive-green above and brownish beneath, the venation obscure except for the broad midrib, plane above and slightly elevated beneath, mark this as distinct vegetatively. The cinnamon-colored pubescence clothing the stout, subterminal inflorescence also is a distinguishing characteristic.

No. 28121, growing at higher elevation near the summit of the mountain, has the same general features as those found in the type material, but the leaves are smaller, the branchlet-internodes and the inflorescences shorter, and the cupules more consistently dentate. These variations may possibly reflect the more exposed habitat.

Although the species at first glance appears to bear a subterminal inflorescence, close examination shows young leaves already developing from the terminal bud. At the maturity of the fruit, the bud may conceivably be fully developed, relegating the earlier subterminal inflorescence to an axillary position.

The last three new species, similar in aspect, appear to belong to the same complex. *Aniba cinnamomiflora* and *A. percoriacea* bear a closer relationship through their mutual character of pubescent, stipitate ovary. The former may have an affinity with *A. cylindriflora* Kostermans from Amazonian Brazil.

Aniba affinis (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 63. 1889.

Aydendron affine Meissner in DC. Prodr. **15**^{1}: 92. 1864.

Type. Secus Rio Negro, inter Barcellos et San Gabriel, Brasiliae septentrionalis, Dec 1854, *Spruce 3769* (isotype, fl. NY).

Distribution. Small tree occurring in the sandstone areas of Brazil and Venezuela, along the Rio Negro and its tributaries and the Río Orinoco, and reported farther south in Brazil in the upper Rio Madeira region. VENEZUELA. Amazonas: Río Orinoco between Tamatama and Caño Manaviche, *Level 2* (fl. NY). BRAZIL. Amazonas: Rio Negro, Serra de Cabary, *Froes 21478* (fl. NY), Tapera, Padauiry, *22714* (fl. NY).

The species is one of a number of the Lauraceae that are vaguely reminiscent of several species but not particularly outstanding in any one characteristic. It is a combination of characteristics, however, that, despite its superficial lack of distinction, in the dried state at least, makes it more or less readily recognized. Level's number is less sparsely pubescent than the type, the ovary being rather papillose than pubescent. Froes' collection bears leaves that are generally smaller than those of the type and more often broadly elliptic.

The species was originally described by Meissner from *Spruce 3769* and *Riedel s.n.*, from around Barra (Manáos). Kostermans has separated the syntypes, placing the latter in *A. trinitatis* (Meissner) Mez on the grounds that the ovary of the latter specimen is glabrous. It is not pubescent as that of the Spruce number, but papillose as noted in Level's collection. In other respects, the two agree very well.

Aniba panurensis (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 58. 1889.

Aydendron panurense Meissner in DC. Prodr. **15**^{1}: 89. 1864.

Type. Prope Panuré ad Rio Uaupés, Amazonas, Brazil, *Spruce 2603* (isotype, fl. NY).

Distribution. Aromatic trees, growing at varying altitudes along the Rio Negro and its tributaries in Brazil and Colombia (possibly in the Cordillera Macarena), and along tributaries of the Río Orinoco in Bolívar, Venezuela. VENEZUELA. Bolívar: occasional along Río Parguaza near Raudal Maraca (about 110 river km from mouth), *Wurdack & Monachino 41043* (fr. NY). COLOMBIA. Comisaría del Vaupés: riberas del Río Inírida (longit. 69°45′ W.), sitio ''Raudal Alto'' o Mariapiri, margen derecha (en la orilla del río), *A.*

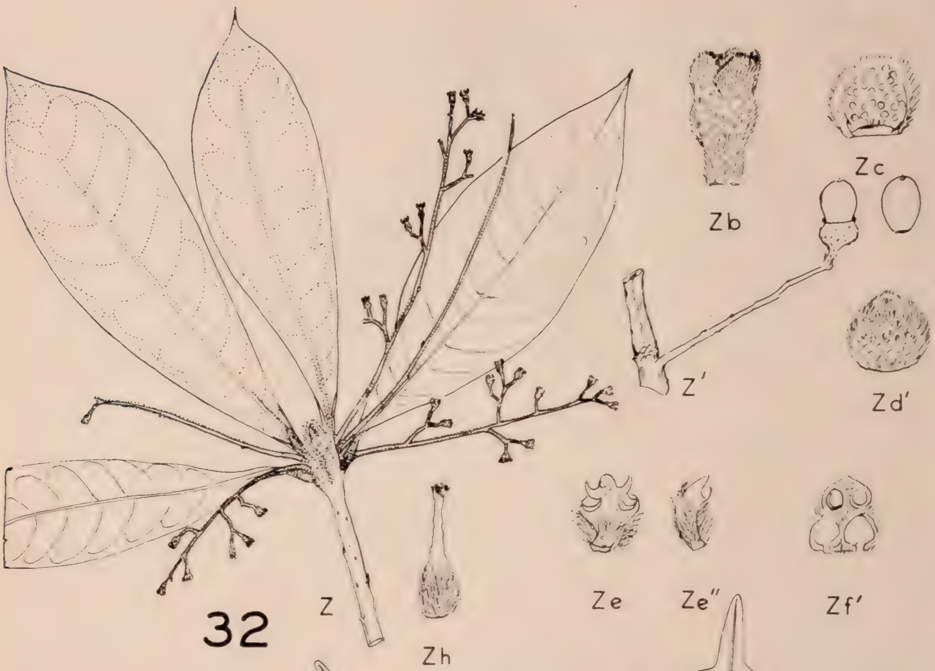
Fernandez 2105 (fr. US); orillas del Río Macaya, *Gutierrez V. & Schultes 640* (fr. A). Comisaría del Vichada: *Romero C. 1263* (fr. US). Intendencia del Meta: Cordillera La Macarena (extremo nordeste), macizo Renjifo, faldas orientales, *Idrobo & Schultes 842* (fr. F), dense forest, Central Mountains, Approach Ridge, *Philipson & Idrobo 1819* (fr. BM, NY).

This species was combined in synonymy under the widespread *Aniba firmula* (Nees) Mez by Kostermans. It is possible that the two are conspecific; if so, perhaps *A. muca* (R. & P.) Mez from Peru is also a manifestation of the same taxon, as he has suggested. Until a detailed consideration of more material from the latter area is at hand, I believe that all three should be maintained as separate species. The type of *A. firmula,* based on Sellow's collection from lower Brazil, appears, as does other material examined from this region, to be more consistently pubescent in the inflorescence which is usually more robust, the leaves in general being smaller, with a tendency in some instances to be broader. These represent a more or less homogeneous assemblage, different in aspect from the specimens from Amazonian and northern regions. The above-mentioned characteristics obtain in the main for the Gardner and Glaziou numbers cited by Mez as well as specimens of *A. laevigatum* (Meissner) Mez, included by Kostermans under *A. firmula*. With the exception of *A. panurensis*, these may well be conspecific with the latter.

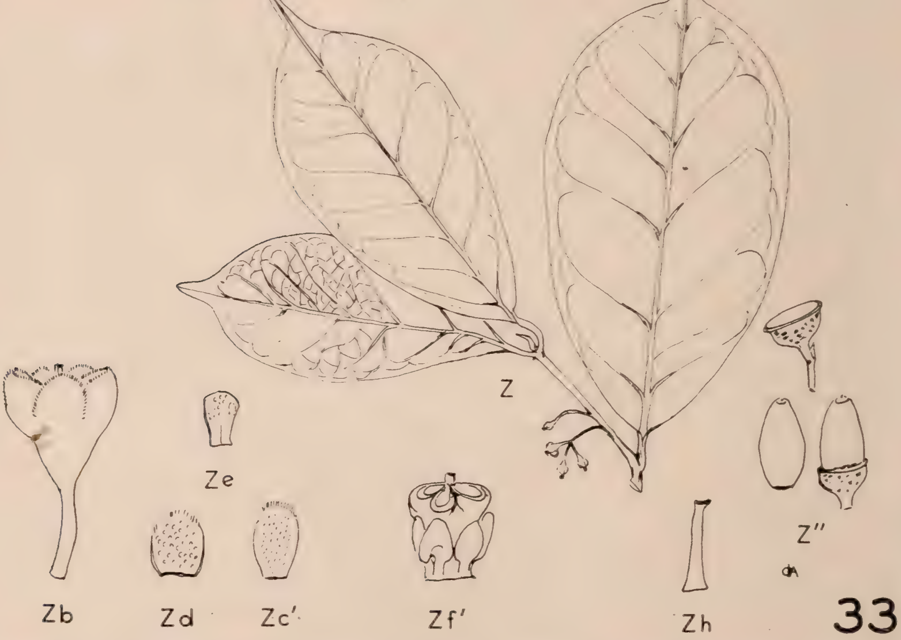
Aniba simulans C. K. Allen, sp. nov. Fig. 32.

Arbor ad 15–20 m alt., gemmis magnis ovoideis dense adpresseque ferrugineo-tomentosis, ramulis teretibus fulvo-pubescentibus, mox glabris griseis conspicue cicatricibus et corticosis. Folia verticillata vel subverticillata, petiolis crassis fulvo-pubescentibus mox glabris griseis corticosis, ad basim intumescentibus, ad 12 mm longis, ad basim 2–3 mm latis, laminis supra glabris subtus glabrescentibus, ellipticis vel obovato-ellipticis, (7–) 10–15 (–18) cm longis et (2.8–) 4–5 (–5.5) cm latis, margine recurvatis, ad basim attenuatis saepe leviter decurrentibus, ad apicem acutis vel apiculato-acuminatis, acumine aliquando ad 2 cm longo, penninerviis, costa supra leviter subtus conspicue elevata et pubescenti, nervis 10-paribus intus marginibus confluentibus supra inconspicuis subtus conspicue elevatis et pubescentibus, ad angulo 67–55° divergentibus. Inflorescentia axillaris subterminalisque, dense pallideque ferrugineo-pubescens, paniculata, aliquantum lato-racemosa, pedunculo 2–4 cm longo, (6–) 10–14 cm longo, rachis robustis ± curvatis. Flores (post anthesin) ad 3.5 mm longi, fulvo-pubescentes, pedicellis ad 1 mm longis; perianthio urceolato, lobis late ovatis vel subspathulatis concavis, ad 1–1.2 mm longis, tubo quam lobis longiore; staminibus fertilibus pubescentibus, ad 0.8 mm longis, ser I & II antheris subrotundatis, locellis parvis apicali-introrsis, connectivo anguste obtuse producto, filamentis ± crassis antheris subaequalibus, ser III antheris subrotundatis, locellis parvis extrorsis, ad 0.4 mm longis, filamentis ± crassis biglandulosis, glandulis subsessilibus, ser IV 0; gynoecio ad 2 mm longo, ovario ± ovoideo ad summam pubescenti, quam stylo gracili pubescenti duplo longiore, stigmate parvo plano-triangulari. Infructescentia ramulis rigidis quam inflorescentia aliquantum incrassatior cortice rachidis cortice ramulorum simulanti. Fructus (separatus) caeruleus, fide coll., ad 1.5 × 1 cm, ellipsoideus vel obovoideus, minute apiculatus, cupula urceolata glabra minute verruculosa, ad 7 mm longa, 8 mm diam et 5 mm alt., pedicello brevi-incrassato.

Vernacular names. Laurel amarillo (Williams); Tau-wan-yek (Steyermark).



32



33

FIG. 32. *Aniba simulans* (*Williams 11764*). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc, tepal, ser I, ventral, × 10. Zd', tepal, ser II, dorsal, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze", stamen, ser I & II, lateral, × 10. Zf', stamen, ser III, dorsal, × 10. Zh, ovary, × 10. Z', fruiting branchlet, × 0.5. FIG. 33. *Licaria simulans* (*For. Dept. Brit. Guiana 5290* [*F2545*]). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc', tepal, ser I, dorsal, × 10. Zd, tepal, ser II, ventral, × 10. Ze, staminodium, ser I & II, dorsal, × 10. Zf', stamens, ser III, dorsal, × 10. Zh, ovary, × 10. Z", fruit, × 0.5.

Type. Arbol de tamaño mediano o alto, de 15–20 m de alto, copa tendida y las ramas algo delgadas, tronco derecho, redondo sin ramas por 2/3 partes de la altura entera, sin aletones, hasta de 50 cm de diámetro, corteza de color gris claro, algo lisa, corteza interna rojiza, madera amarillenta, exportada para Ciudad Bolívar para tablas, frs. azulejos en su madurez, en el margen de la selva no inundada de Guayapo, Bajo Caura, Bolívar, Venezuela, 100 m, 12 Apr 1939, *Llewelyn Williams 11764* (holotype, fl., fr. A, US).

Distribution. Tree with verticillate or subverticillate, elliptic or obovate leaves at branchlet-tips, occurring in damp forests along the lower Caura River Basin at low altitudes and on the neighboring Guayana Highlands up to 1220 m, in Bolívar, Venezuela. VENEZUELA. Bolívar: crece en selva higrofítica macrotérmica, Escaso, 90 km de El Dorado hacia Sta. Elena, *Foldats 2706* (fr. NY); wooded slopes of Quebrada O-paru-má, between Santa Teresita de Kavanayén and Río Pacairao (tributary of Río Mouak), 1065–1220 m, *Steyermark 60394* (y. fr. NY), Ptari-tepuí, dense forest at base of Cerro along Río Karuai, *60638* (st. F).

The coarse, densely clustered leaves bearing axillary or subterminal inflorescences recall in habit several species of *Mezilaurus,* but the floral structures are typical of *Aniba.* When the bark of the twigs is cut or bruised, a fragrance characteristic of the genus is apparent. The second-year growth branchlets, roughened by scars of deciduous leaves and overlaid with a greyish, corklike layer, are distinctive in the dried state.

Licaria puchury-major (Martius) Kostermans, Meded. Bot. Mus. Utrecht **42**: 583. 1937.

Ocotea puchury-major Martius in Buchner, Repert. **35**: 171. 1830.

Type. In sylvis ad Tabatinga, Provinciae Rio Negro, Brasil., *Martius* (holotype, fr., photo F, GH).

Distribution. Tree reported, in addition to the type locality (Rio Solimoes, Amazonas), to occur along Rio Negro and in cultivation in Pará; possibly in the sandstone areas of southern Venezuela. VENEZUELA. Amazonas: much-branched tree to 8 m, cupule red-brown, fruit green, along Río Guainía between Caño San Miguel and Maroa, *Wurdack & Adderley 43258* (fr. NY).

A little-collected tree with very rigid, coriaceous leaves, pale green (in the dried state), shining above, with a prominent midrib and undulate margin, the reticulation conspicuous in varying degrees throughout. The large fruit, up to 5 cm long, enclosed for less than one-third the entire length in a thick, woody cupule often more than 4 cm in diameter and 4–7 mm thick, with the outer margin flaring and undulate, is unusual in the genus.

The Venezuelan material shows leaves consistently narrower and with reticulation on the upper surface inconspicuous, as compared with those of the type.

Allied to this species is the following number: COLOMBIA. Intendencia del Meta: tree up to 15 m, dense forest, Central Mountains Entrada Ridge, *Philipson, Idrobo & Jaramillo 2272* (fr. BM, NY).

This is very probably a new species, but without flowering material I hesitate to describe it. The leaves closely approach the description of the type of *Licaria puchury-major,* in width and reticulation, but both surfaces are shining and the large, ellipsoid, acuminate buds are greyish-sericeous.

There has been much speculation concerning this species, heretofore known only from the type collection. Kostermans cites several numbers of which I have seen only *Riedel s.n.*, collected near Borba, a sterile branchlet from a young sapling, if one may judge from the texture and loose reticulation of the leaf, not in agreement with the photograph of the type. Three sheets of cultivated material in the New York Botanical Garden Herbarium were determined by Ducke as *Licaria* (*Acrodiclidium*) *puchury-major* as follows: *Ducke 45*, Jucabi, Rio Negro, *19981*, Belém do Pará, and *Froes 21085*, Santa Isabel, Rio Negro. These numbers do not accord with the photograph of the type or description. In leaf-structure, particularly the rather fine reticulation of more or less equal density and prominence on both leaf-surfaces, and in the presence of very large flowers, these specimens are precisely the same as those of the Puerto Rican taxon *Licaria brittoniana* Allen & Gregory,[15] which is cultivated locally for general construction. The fruit and subtending cupule of the two species are very different, the fruit of the Puerto Rican taxon being not more than 15 mm long, oblong with the base and apex more or less rounded, the outer cupule-margin slightly undulate, and the inner 3 mm longer and slightly lobed.

Licaria canella (Meissner) Kostermans, Meded. Bot. Mus. Utrecht **42**: 583. 1937.

Aydendron canella Meissner in DC. Prodr. **15**^{1}: 90. 1864.

Type. Acarouany, French Guiana, *Sagot 1190* (isotype, st. NY).

Distribution. Tree to 25 m, reported by Kostermans from the Guianas, Trinidad, and Brazil (Rio Negro). BRAZIL. Territorio Amapá: occasional along Rio Oiapoque near Mecro, opposite Clevelandia 3° 48′ N 51° 53′ W, *Maguire, Pires & Maguire 47092* (fl., fr. NY).

A seemingly widespread species of the lowland tropics characterized by stout, straight branchlets, those of the current year's growth reddish-brown, the older greyish, and by the flat, extremely coriaceous leaves, extending beyond the terminal, densely flowered inflorescences. The species recalls *L. cayennensis*, also from the Guianas, but the rusty-verrucose fruit cupules, as contrasted with the smooth cupule of the latter, separate the two.

Licaria cayennensis (Meissner) Kostermans, Meded. Bot. Mus. Utrecht **42**: 583. 1937.

Aydendron ? cayennense Meissner in DC. Prodr. **15**^{1}: 95. 1864.

Vernacular name. Wabaima silberballi (Brit. Guiana).

Type. Cayenne, French Guiana [*Patris 41*] (isotype, fr. NY).

Distribution. Tree reported heretofore from the Guianas, now known to occur in the adjoining area in Venezuela, northwest of British Guiana. VENEZUELA. Territorio Delta Amacuro: infrequent in forest near Río Toro, Serranía Imataca, *Wurdack & Monachino 39680* (fr. NY). BRITISH GUIANA. Semi-Wallaba, semi-marsh forest on white sand, Makauria Creek, Essequibo River, *For. Dept. Brit. Guiana 5367* (*F 2579*) (fr. NY).

The leaves and general habit of the Venezuelan collection are typical of the species. The short, stout infructescences bear immature fruits longer than normally reported and subtended by cupules sparsely covered with rusty warts.

---

[15] Brittonia **7**: 267–269. 1951.

Licaria meissneri (Mez) Kostermans, Meded. Bot. Mus. Utrecht **42**: 597. 1937.

Acrodiclidium meissneri Mez, Jahrb. Bot. Gart. Berlin **5**: 98. 1889.
Acrodiclidium guyanense var. γ *caudatum* Meissner in DC. Prodr. **15**^{1}: 85. 1864.

Type. Prope San Carlos, ad Rio Negro, Brasiliae borealis, 1853–54, *Spruce 3058* (isotype, y. fr. NY).

Distribution. Tree to 16 m, with extremely slender branchlets, heretofore known only from the type locality, now reported from the sandstone area of Central Venezuela at an altitude of 280 m or less. VENEZUELA. Bolívar: arbol extraviado, 14–16 m de alto, copa tendida, tronco algo derecho y redondo, 40 cm diámetro con varias raíces pequeñas superficiales, corteza escamosa, marrón oscure, fr. negruszco y lustroso en su madurez, en la playa arenosa del Medio Caura, Salto de Para, *Williams 11450* (fr. A, US), fr. azúl verdoso, en la orilla del Salto de Para, *11353* (fr. F).

The above collections bear mature fruit, ellipsoid, obtuse at both ends, more than 2 cm long and 1.3 cm broad, enclosed barely one-quarter their entire length in rugulose, cyathiform cupules 12 mm long and 16 mm in diameter and about 7 mm deep, slightly flaring at the finely double margin, and covered with small, pale tan warts, abruptly constricted at the base and seated on slightly enlarged pedicels about 3 mm long and 1 mm or less in width.

The species is recognized by the smallish (8–12 cm long), elliptic, long-acuminate leaves, dark brown above, in the dried state, and paler beneath. They are not, however, opposite, as has been reported, but sometimes subopposite towards the tip of the branchlets, as noted by Mez.

Licaria simulans C. K. Allen, sp. nov. Fig. 33.

Arbor ad 13 m alt., gemmis parvis anguste ovoideis acuminatis ± falcatis, sparse pubescentibus aliquantum lucidis atris ut videtur minute papillosis, ramulis atro-rubescentibus ± lucidis mox griseis, aliquantum gracilibus teretibus glabrescentibus. Folia alternata, petiolis glabris striatis mox crassioribus canaliculatis, 5–8 (–10) mm longis, laminis utrinque glabris membranaceis mox coriaceis, viridibus, supra juventute lucidis mox sublucidis, subtus saepe sublucidis pallidioribus, ellipticis vel subobovato-ellipticis, 8–15 cm longis et 3–6.5 cm latis, ad basim acutis vel subacuminatis, ad apicem plerumque abrupte anguste longeque acuminatis raro gradatim attenuato-acuminatis, acumine ad 2.5 cm longo plerumque obtuso, maturitate margine recurvatis, penninerviis, costa conspicua, supra leviter subtus prominenter elevata, nervis 4–6-paribus, supra gracilibus obscure subtus conspicue elevatis ad angulo 55° divergentibus, ad marginem ad 5 mm confluentibus prope marginem tenuiter anastamosantibus, rete venularum utrinque laxo ± conspicuo. Inflorescentia axillaris, glabrescens vel glabra, brevis, tenuis, ad 1.5 cm longa, pauciflora. Flores parvi, 2.7 mm longi, pedicello gracili 1.2 mm longo; perianthio suburceolato pallide eburneo, fide coll., lobis ovatis sparse pubescentibus, ad 0.9 mm longis, semper recurvatis fide coll., quam tubo leviter longioribus; staminodiis sterilibus ser I & II obovato-ligulatis membranaceis ad 0.7 mm longis, staminibus fertilibus ser III connatis in tubo inclusis, ad 1.2 mm, antheris subrotundatis filamenta aequantibus, robustis longioribus biglandulosis, glandulis magnis filamentis aequantibus, ser IV O; gynoecio gracili ad 1.2 mm longo (ut videtur abortivo?) ovario compresso? ellipsoideo: ab stylo satis crasso indistincto, stigmate ± plano leviter lobato. Infructescentia incrassata, glabra, ad 4–5 mm longa. Fructus viridis fide coll.,

oblongo-ellipsoideus, ad apicem depressus minutissime apiculatus, 2.5 × 12 mm, cupula coccinea fide coll., cyathiformi minute rugulosa, ad 12 mm longa, 13 mm diam. et 5 mm alt., margine graciliter duplici, pedicello brevi, ad 2–3 mm longo, subtenta.

Vernacular names. Yekuru (For. Dept. Brit. Guiana); pichuri mirim (Archer).

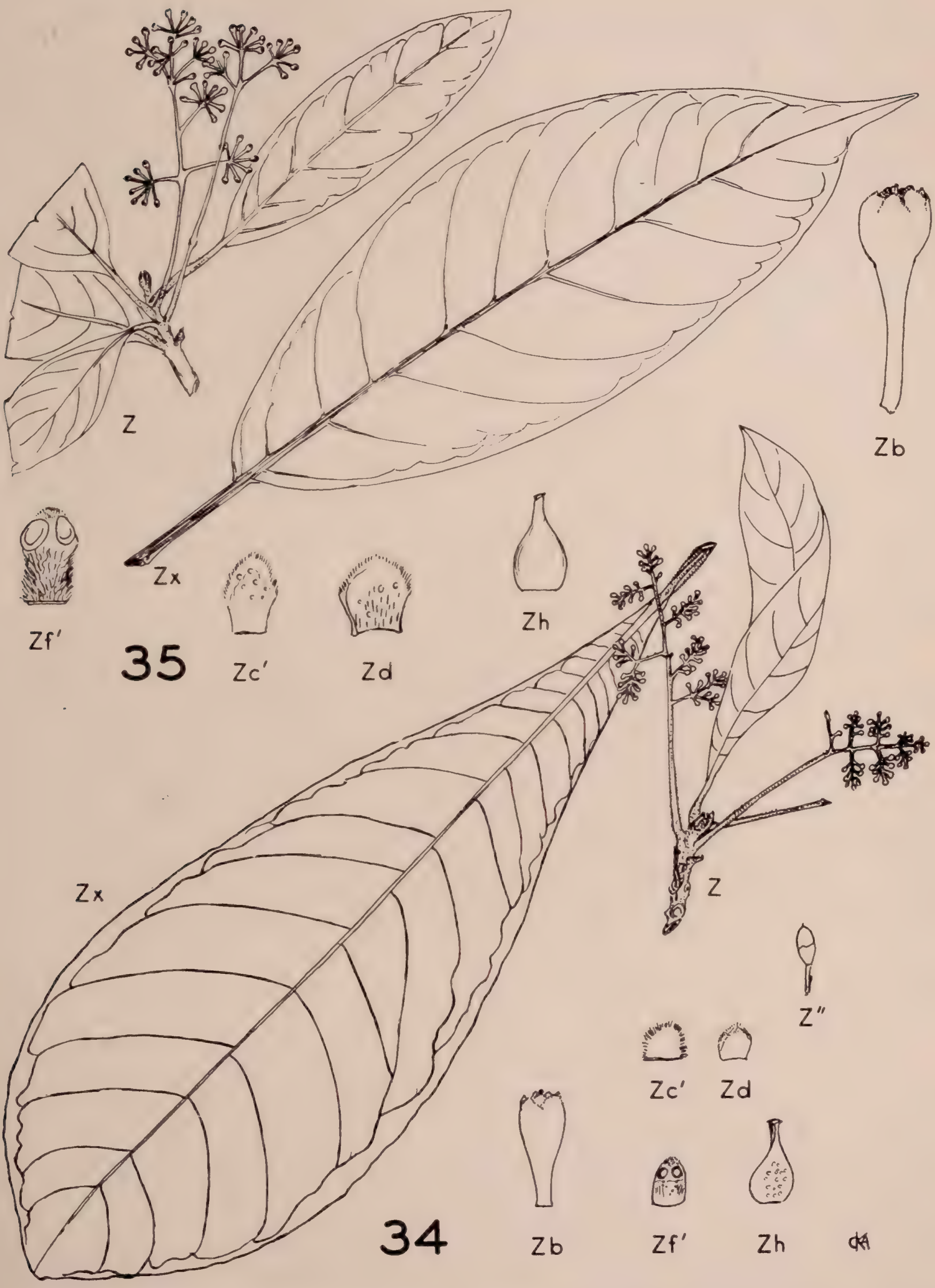
Type. Forty-foot tree, 4 inches diameter, bark and wood strongly aromatic, leaves thinly leathery, glossy, petioles brittle, flowers 2.5 mm on a delicate, axillary pedicel, very small, perianth-lobes revolute, pale cream, from mixed forest, Moraballi Creek, Essequibo River, British Guiana, 13 Sep 1945, *For. Dept. Brit. Guiana 5290* (*Field No. F 2545*) (holotype fl., y. fr. NY).

Distribution. Tree to forty feet or less, along rivers of British Guiana and Suriname and possibly in Pará, Brazil. BRITISH GUIANA. Rare in Morabudea forest on lateritic, gravelly soil, Kamarang Station, Upper Mazaruni River, *Maguire & Fanshawe 32330* (fr. NY). SURINAME. On ferrite-laterite, Line A, east slopes of Plateau B, Nassau Mountains, Marowijne River, *Maguire 40778* (y. fr. NY). BRAZIL. Pará: small tree, bark has spicy odor, in forest reserve for Belém watershed, Utinga, 1–2 km N of Belém, *Archer 7608* (y. fr. NY).

A species of *Licaria* which superficially resembles the members of the *Ocotea caudata* complex. It is separated at once, however, on examination of the flowers which show the structure typical of *Licaria*. The species varies from the norm in having a very slender gynoecium, perhaps because the particular specimen was collected in young fruit and more than usual pressure exerted by the connate tube—a fact borne out by the difficulty experienced in dissecting the very tightly adhering staminal column from the style. The slender gynoecium resembles in appearance abortive structures in some staminate flowers of *Ocotea*. The relationship within the genus is not easily ascertained. Possibly the affinity lies with *L. vernicosa* (Mez) Kostermans of which I have seen only a photograph of the type.

Mezilaurus wurdackiana C. K. Allen, sp. nov. Fig. 34.

Arbor ad 50 cm DBH, gemmis anguste ovoideis pallide ferrugineo-pubescentibus, ramulis juventute dense adpresseque ferrugineo-pubescentibus, mox crassis cicatricosis, ± brunneis, striatis aliquantum glabrescentibus. Folia alternata, ad apicem congesta vel subverticillata, petiolis robustis dense pubescentibus obscure canaliculatis ad basim incrassatis, 0.5–15 mm longis et ad 3 mm latis, laminis supra glabrescentibus, costa excepta, subtus pubescentibus, subcoriaceis, supra viridescentibus subtus brunneo-viridescentibus, obovatis, (15–) 22–27 cm longis et (6–) 8–10 (–12) cm latis, ad basim acute attenuateque acuminatis saepe obliquis, ad apicem aliquando obtuse lateque acutis plerumque rotundatis raro emarginatis, penninerviis, costa supra leviter elevata ad basim latiore ± pubescenti, subtus prominenter elevata pubescentique, nervis 12–15-paribus ad basim ± obscuris, supra pallide brunneis ± glabris subtus conspicue elevatis pubescentibus, ad angulo 67–55° divergentibus, rete venularum supra obscuro subtus conspicuo graciliter elevato. Inflorescentia subterminalis satis gracilis minute glabrescens, ± racemoso-paniculata, ad 12 cm longa, pedunculo ad 3 cm longo. Flores numerosi ad apicem ramulorum lateralium, ad 3 mm longi, in pseudo-umbellis congesti, pedicello ad 1 mm longo indistincto; perianthio suburceolato ad 1 mm longo, lobis membranaceis ovatis glabris costa prominenti, ad 0.5 mm longis, tubo lobis subaequali; staminibus ser I & II O, ser III ± ovatis, ad 0.6 mm longis, filamentis indistinctis eglandulosis, antheris aequalibus vel



35

34

FIG. 35. *Mezilaurus maguireana* (*Maguire, Wurdack & Keith 41698*). Z, habit, flowering branchlet, × 0.5. Zx, leaf from flowering branchlet, × 0.5. Zb, flower, × 5. Zc′, tepal, ser I, dorsal, × 10. Zd, tepal, ser II, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zh, ovary, × 10. FIG. 34. *Mezilaurus wurdackiana* (*Z, Zb–Zh, Wurdack & Guppy 91; Z′, Froes 30976*). Z, habit, flowering branchlet, × 0.5. Zx, leaf from flowering branchlet, × 0.5. Zb, flower, × 5. Zc′, tepal, ser I, dorsal, × 10. Zd, tepal, ser II, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zh, ovary, × 10. Z″, young fruit, × 0.5.

leviter longioribus, locellis satis magnis; gynoecio ad 1.1 mm longo, ovario ovoideo quam stylo gracili duplo longiori. Infructescentia et fructus ignoti.

Type. Tree 50 cm DBH, leaves alternate, exstipulate, buds green, 12 km east of Ranch House, headwaters of Río Saca, Hato La Vergareña, Bolívar, Venezuela, 420–500 m, 18 Oct 1954, *J. J. Wurdack & N. G. L. Guppy 91* (fl. NY).

Vernacular names. Chupon (Wurdack & Guppy); Itauba (Froes).

Distribution. Tree to 10 m, known only from the type locality, Venezuela, and from Pará, Brazil. VENEZUELA. Bolívar: Hato La Vergareña, *Wurdack & Guppy 114* (st. NY). BRAZIL. Pará: Igarapé da lama, terra firme, mata virgeni, Planalto de Santarém, *Froes 30976* (fl. NY).

This has been associated with *M. lindaviana* Schwacke & Mez, described from Río Branco and reported from Amazonas and Minas Gerais also in Brazil and from British Guiana. I have seen neither the type of the latter species, *Schwacke 7080,* with *Glaziou 19798* associated with it, nor the type of *Silvia duckei* (*Ducke 16302*) which Kostermans includes in the species. However, from the descriptions and material at hand, *M. wurdackiana* appears to be distinct from the Río Branco taxon. The leaves are larger (25–30 cm long and 10–12 cm wide), less broadly obovate and very long-attenuate at the base, opaque rather than shining above, and the inflorescences are approximately half the length of the leaves.

Mezilaurus maguireana C. K. Allen, sp. nov. Fig. 35.

Arbor ad 15 m alt., gemmis ovoideis acutis vel brevi-acuminatis fulvo-sericeo-pubescentibus, ramulis obscure striatis teretibus pallide adpresse fulvo-pubescentibus. Folia subverticillata, petiolis satis robustis mox incrassescentibus praecipue ad basim fulvo-pubescentibus ± teretibus, (15–) 20–25 mm longis, laminis supra pallide viridescentibus saepe minute areolatis papillosis, subtus sparse fulvo-pubescentibus glabrescentibus glaucescentibus, subcoriaceis, ellipticis, (8–) 15–20 cm longis et (3–) 6–7.5 cm latis, ad basim oblique acutis, ad apicem obtuse acutis acuminatisve, acumine ad 2.5 cm longa apiculata, aliquando emarginatis, penninerviis costa supra glabra subtus leviter conspicue fulvo-pubescenti elevata, nervis 8–9-paribus pallide luteis, ad angulo 55–45° divergentibus, rete venularum gracili supra ± obscuro subtus conspicuore. Inflorescentia subterminalis anguste paniculata, satis gracilis, glabra ad basim leviter sparseque pubescens, pedunculo ad 7 cm longo. Flores 5–9, in umbellis terminalibus, ad 6 mm longi, pedicellis 3–4 (–5) mm longis satis gracilibus; perianthio campanulato, luteo fide coll., ± carnoso glabro, lobis ovatis leviter incurvatis margine hyalinis, ad 1 mm longis et 0.8 mm latis, tubo ad 1 mm longo; staminibus ser I & II O, ser III fertilibus carnosis pubescentibus ad 0.6 mm longis, filamentis indistinctis eglandulosis, antheras aequantibus, locellis satis magnis, ser IV O; gynoecio ad 1.2 mm longo, ovario ovoideo glabro quam stylo gracili duplo longiore. Infructescentia et fructus ignoti.

Type. Tree 15 m, flowers yellow, forest edge just east of Maroa, Río Guainía, Amazonas, Venezuela, 120–140 m, 5 Oct 1957, *Bassett Maguire, John J. Wurdack & William M. Keith 41698* (holotype, fl. NY).

Distribution. A tree to 15 m, known only from the lowland area along the Río Guainía in Amazonas, Venezuela, the type locality.

The nearest relative of this species is *M. sprucei* (Meissner) Taubert ex Mez, known to date only from the type locality near San Gabriel de Cachoeira on the Rio Negro, in Amazonas, Brazil. The latter, however, has consistently smaller leaves sharply long-acuminate, and a weak, pendulous, very tenuous inflorescence

up to 18 cm long, bearing minute flowers supported by filamentous pedicels often over 2 cm in length.

Endlicheria arunciflora (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 131. 1889.

Ampelodaphne arunciflora Meissner in DC. Prodr. **15**^{1}: 81. 1864.

Type. Prope San Carlos, ad Río Negro, Amazonas, Venezuela, *Spruce 3061* (isotype, ♂ fl. NY).

Infructescentia robusta, glabra glabrescensve, brunnea, rugulosa, ut videtur racemoso-paniculata, 10–15 cm longa, pedunculo crasso ad 4 cm longo. Fructus viridis, oblongo-ellipsoideus, apiculatus, apice basique ± obtusus, ad 25 × 13 mm, cupula lignosa cyathiformi in sicco ferrugineo-rubra, ad 12–16 mm longa, 15 mm diam., et 4–5 mm alta, stipite robusto, ad 6 mm longo et 4 mm lato, pedicello brevi, crasso, ad 2–7 mm longo.

Distribution. A small to medium-sized tree with stiffly coriaceous, lanceolate or elliptic, rarely oblanceolate, verticillate leaves distinctly glaucous on the lower surface, occurring on sandstone in the vicinity of Río Orinoco and Río Negro and their tributaries, in Venezuela at 110–150 m, and reported as well from Loreto, Peru. VENEZUELA. Amazonas: occasional along Caño Tamatama (a black-water caño on right bank of Orinoco just above Tamatama), *Wurdack & Adderley 43153* (fr. NY). along Río Yatua between mouth and Laja Catipan, *43435* (♂ fl. NY); inundado en las rebalsas arboreadas del Caño Pendare, Capihuara, Alto Casiquiare, *Williams 15738* (st. A).

The fruit of this species has not heretofore been recognized. The unusually coriaceous leaves, early extremely glaucous, later becoming less so, with the deeply impressed although slender veins, the confluence of which 3–5 mm from the margin forms a pattern similar to that found frequently in the genus *Pleurothyrium,* are all characteristics indicating that the above-cited numbers belong to *E. arunciflora.*

? **Endlicheria macrophylla** (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 128. *pl. 2, f. 8.* 1889.

Ampelodaphne macrophylla Meissner in DC. Prodr. **15**^{1}: 81. 1864.

Type. In vicinibus Barra, Rio Negro, Amazonas, Brazil, Apr 1851, *Spruce 1453* (isotype ♂ fl., fr. NY); *Riedel 1411* (isotype, fr. NY).

Distribution. Tree to 15 m, occurring chiefly along the Amazon River and its tributaries, reported from the vicinity of Rio de Janeiro and possibly occurring in savannas in the sandstone area along the Río Orinoco in Amazonas, Venezuela. VENEZUELA. Amazonas: in Savanna No. 3, northeast base of Cerro Yapacana, Río Orinoco, *Maguire, Cowan & Wurdack 30601* (fr. NY).

The specimen cited above bears infructescences with fruits obviously attacked by galls. In all probability it belongs with this species, for it displays the variable characteristics of the leaves of the type specimens, and the fruit-cupules, although borne on slightly longer pedicels, are similar.

Endlicheria cocuirey Kostermans, Meded. Bot. Mus. Utrecht **42**: 522. 1937.

Type. Tree 4 m, flowers white, forest riverside, Florida, Río Putumayo, at mouth of Río Zubineta, Loreto, Peru, about 180 m, May–Jul 1931, *G. Klug 2253* (isotype, ♂ fl. NY).

Vernacular Names. Hioma Cocuir-ey (Huito Indian, Klug); Laurel Rebalsero (Williams).

Distribution. Tree to 12 m, besides occurring in the type locality found also in the Solimoes River Basin of Brazil and in the sandstone area of southern Venezuela, along tributaries of Río Orinoco. VENEZUELA. Amazonas: cupule red, fruit green, along Río Padamo, about 15 km above mouth, *Maguire & Wurdack 34727* (fr. NY); occasional along Río Orinoco just above Tamatama, *Wurdack & Adderley 43647* (♂ fl. NY); en la margen del Casiquiare, Alto Orinoco, *Williams 15179* (fr. F, US). BRAZIL. Amazonas: terra firme, Riosinho Juruema, Rio Jutahy, *Froes 21022* (♂ fl. F, NY).

A member of the "bracteata" group of endlicherias bearing large, verticillate, obovate, acuminate leaves with subcordate bases, the upper surfaces somewhat shining and reticulate. *Maguire & Wurdack 34727* shows a stout, heavily fruited, glabrescent infructescence to 10 cm in length, borne on a peduncle to 20 mm long and 5 mm in diameter. The green, ellipsoid fruits more or less blunt at either end, umbonate at the apex, sharply and conspicuously apiculate, approximately 2 × 1 cm, are subtended by shallow, flaring, stipitate, cyathiform cupules, about 12 mm in diameter and 5–7 mm deep, thin-margined, subsessile, seated on a short, thickened pedicel. This is probably the first fruiting material to be noted for the species.

Endlicheria directonervia C. K. Allen, sp. nov. Fig. 36.

Arbor ad 6 m alta, ramulis brunnei-ferrugineo-tomentosis teretibus. Folia subverticillata, petiolis robustis brunneo-ferrugineo-tomentosis, ad 3 cm longis ad basim saepe incrassatis et ad 4 mm latis, laminis utrinque aliquantum molliter sparseque pubescentibus, supra mox glabrescentibus membranaceis, supra aliquantum lucidis viridibus, subtus pallidioribus, ellipticis raro anguste subobovatis, (15–) 25 cm longis et (5.5–) 10 cm latis, ad basim acutis, ad apicem obtusis vel abrupte acuminatis apiculatis, margine ad basim saepe leviter recurvatis, penninerviis, costa supra leviter subtus valde elevata, utrinque pubescenti, nervis ad 20-paribus gracilibus utrinque pubescentibus, supra leviter subtus elevatioribus, subite ad costam ad angulo 90–72° divergentibus vel ad marginem 56° arcuantibus et 0–2–5 mm confluentibus, rete venularum utrinque tenuiter conspicuo. Inflorescentia axillaris ut videtur subterminalis, gracilis, pubescens, anguste paniculata, ad 20 cm longa, saepe in summa parte ramosa, pedunculo ad 6 cm longo. Flores dioici, ♂ ad 3.5 mm longi, graciles, dense longeque pubescentes, pedicello gracili, ad 5 mm longo, bracteis tenuibus conspicuis persistentibus pubescentibus subtenti; perianthio campanulato pubescenti, lobis tenuibus membranaceis reflexis, exterioribus ovatis interioribus ± ellipticis, ad 1.3 mm longis, tubo ad 1 mm longo; staminbus ser I & II ad 0.9 mm longis, antheris locellis introrsis, filamentis subaequalibus, ser III ad 1.1 mm, antheris suborbicularibus, locellis magnis extrorsis, filamentis biglandulosis, glandulis sessilibus, ser IV parvis, ad 0.4 mm longis, stipitatis ± subcordatis; gynoecio abortivo ad 1.1 mm longo glabro, ovario tenui, ± ellipsoideo; ♀ ignoti. Infructescentia aliquantum robusta, atro-pubescens vel glabrescens, ad 5 cm longa vel minus. Fructus immaturus? viridis fide coll., oblongo-ovoideus, apice concavo-umbonatus, obscure minuteque apiculatus, ad 15 × 10 mm, cupula cyathiformi minute verruculosa tenuiter vermiculata fide coll., extus glabrescenti intus pubescenti, ad 8 mm longa et ad 12 mm lata, stipite brevi, pedicello brevi, 2–3 mm longo, bracteolis pubescentibus, persistentibus.

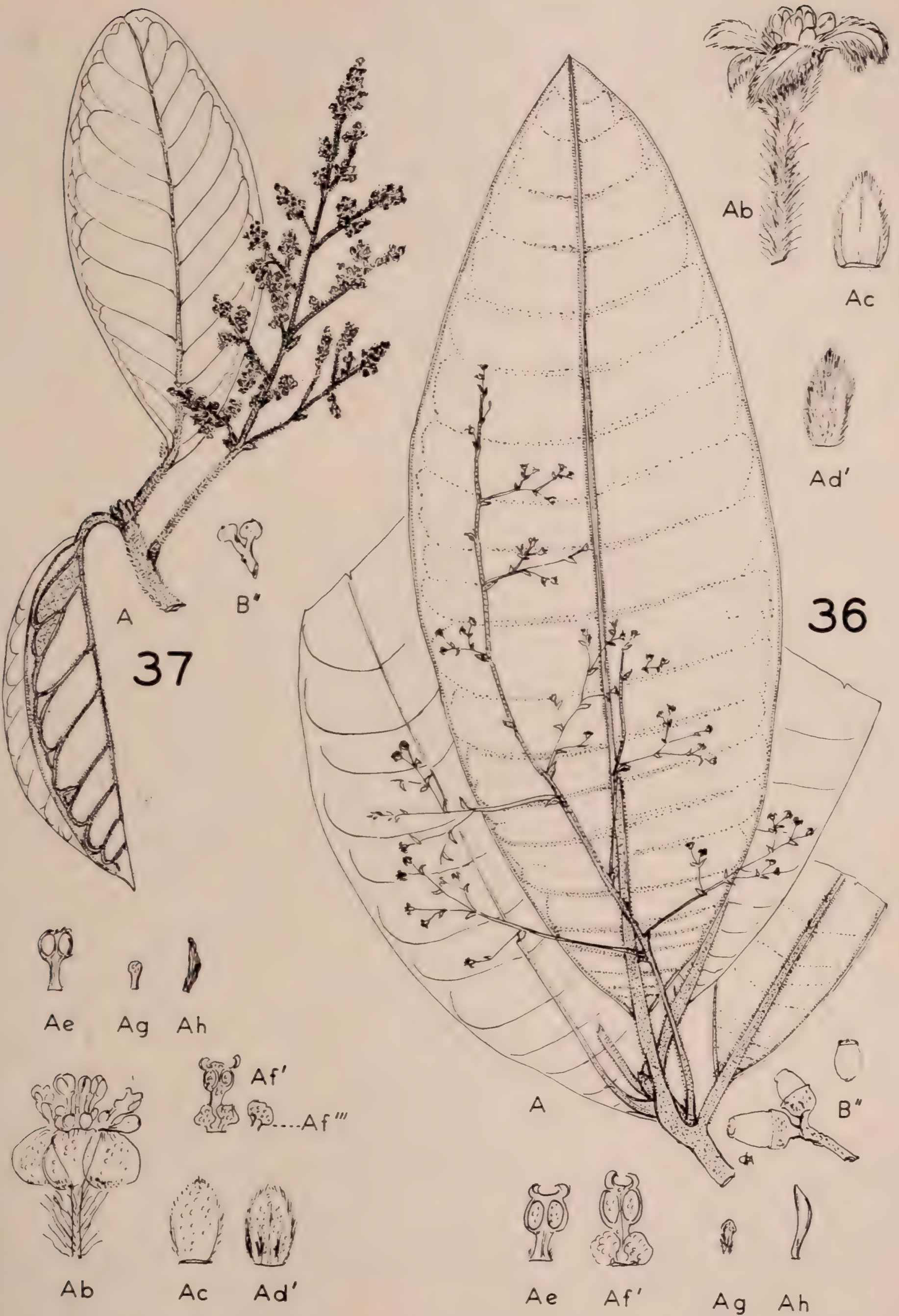


FIG. 36. *Endlicheria directonervia* (*A–Ah, Maguire & Politi 28428* ♂; B″, *Williams 14370*). A, habit, ♂ flowering branchlet, × 0.5. Ab, flower, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Ag, staminodium, × 10. Ah, aborted ovary, × 10. B″, fruit, × 0.5. FIG. 37. *Endlicheria levelii* (*A–Ah, Level 127; B″, Krukoff 8096*). A, habit, ♂ flowering branchlet, × 0.5. Ab, flower, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Af‴, gland, × 15, approx. Ag, staminodium, × 10. Ah, aborted ovary, × 10. B″, young fruit, × 0.5.

Type. Tree 6 m high, in mixed high forest near Base Camp, Cerro Sipapo (Paráque), 125 m, Amazonas, Venezuela, 17 Jan 1949, *Bassett Maguire & Louis Politi 28428* (holotype, ♂ fl. NY).

Distribution. Tree up to 10 m occurring in the Río Orinoco and Guainía areas of southwestern Venezuela in high, moist forests of the Guayana Highlands above the flood plains at an altitude of about 125 m. VENEZUELA. Amazonas: en la selva alta tupida, fuera de las inundaciones, Maroa, Río Guainía, *Williams 14370* (fr. A, US).

This large, obovate-leaved species, which belongs to the distinctive "bracteata" group, is distinguished by the unusual feature of the veins which consistently arise nearly at right angles from the midrib, very gradually arching towards and becoming confluent at the margin. The species is near and possibly may bear a varietal relationship to the Peruvian *E. tessmannii* O. C. Schmidt.

Endlicheria levelii C. K. Allen, sp. nov. Fig. 37.

Arbor ad 8 (–13) m alta, gemmis ovoideis dense fulvo-tomentosis, ramulis teretibus dense fulvo-tomentosis mox glabris griseis minute rimosis conspicue lenticellatis. Folia subverticillata, petiolis robustis, fulvo-tomentosis mox aliquantum atratis, obscure et breviter canaliculatis, ad 15 mm longis et ad 2.5 mm latis, laminis supra leviter subtus densiore scabri-pubescentibus, coriaceis, supra sublucidis pallide griseo-viridescentibus, subtus opacis pallide brunneis, ellipticis, (8–) 10–12 cm longis et (3.5–) 4.5–5.5 cm latis, ad basim acutis vel obtusis, raro obliquis, ad apicem abrupte breviterque acuminatis vel acutis apiculatisque, raro subemarginatis, ad margine leviter recurvatis aliquando undulatis, penninerviis, costa supra subplana leviter pubescenti, subtus conspicue elevata dense tomentosa, nervis 8–12-paribus supra gracilibus subtus conspicue ± tenue elevatis pubescentibus, ad angulo 55–35° divergentibus, rete venularum supra obscuro subtus conspicuo. Inflorescentia axillaris vel subterminalis, multiflora, bracteata, dense lanato-griseo-tomentosa, pyramidato-paniculata, ad 13 cm longa, pedunculo dense tomentoso ad 4 cm longo. Flores dioici, ♂ ad 2.5 mm longi, pubescentes, pedicello gracili pubescenti, ad 0.9 mm longo; perianthio campanulato albo extus pubescenti, lobis oblongo-ovatis membranaceis extus pubescentibus intus glabrescentibus in anthesin semper reflexis, ad 1 mm longis, exterioribus interioribus subaequalibus, tubo ad 0.8 mm longo; staminibus ser I & II 0.8 mm longis, antheris suborbicularibus, locellis introrsis quam filamentis robustis brevioribus, ser III ad 0.9 mm longis biglandulosis, quam filamentis duplo longioribus glandulis magnis stipitatis, antheris ovato-subrotundatis, locellis extrorsis, ser IV parvis subcapitatis cordatis stipitatis; gynoecio abortivo, tenuiformi, ad 0.4 mm longo; ♀ ignoti. Infructescentia robusta, atro-pubescens, ad 6 cm longa, Fructus immaturus, subglobosus, in cupula in toto inclusus.

Type. Arbol 8 m, flores blancas, Caño Yagual, Río Orinoco 10 km above mouth of Río Atabapo, Amazonas, Venezuela, 150 m, 30 May 1954, *J. Silverio Level 127* (holotype, ♂ fl. NY).

Distribution. Tree to 13 m, growing in the Guayana region of the Río Orinoco in Amazonas, Venezuela, and in the Rio Solimoes basin of Amazonas, Brazil. BRAZIL. Amazonas: terra firma, highland, Municipality of São Paulo de Olivença, near Palmares, *Krukoff 8096* (fr. NY).

This represents another variation in the "bracteata" group quite distinct from all others in having usually small, definitely elliptic leaves more roughly

pubescent than is generally found in the complex. The floral structure conforms to that of the genus. The taxon is perhaps more closely affiliated with *E. multiflora* (Miquel) Mez than with any other member. Similar reticulation occurs in related species which bear leaves that are larger, obovate, and usually not coriaceous.

Endlicheria vinotincta C. K. Allen, sp. nov. Fig. 42A.

Arbuscula ad 1.5 m, ramulis apicalibus juventute vinaceo- mox castaneo- vel brunneo-pubescentibus. Folia alternata, petiolis brunneo-tomentosis mox atro-brunnescentibus, striatis robustis recurvatis, ad 12 mm longis et 3 mm latis, laminis supra glabris, costa excepta, subtus utrinque minute fulvo-sericeo-pubescentibus, coriaceis, supra opacis in sicco viridi-brunneis, subtus pallidioribus glaucescentibus, ellipticis vel anguste ovato-ellipticis margine leviter recurvata, ad 13 cm longis et 5 cm latis ad apicem obtuso-acutis obtuso-subacuminatisve, penninerviis, costa crassa supra utrinque plus minusve castaneo-pubescenti mox glabra flavescenti, ad basim conspicue ad apicem tenuiter et inconspicue elevata, nervis 6–8-paribus supra plerumque, inconspicuis, ad basim pubescentibus, subtus conspicue elevatis pubescentibus, angulo ad costam 85° divergentibus, ad marginem 56°, rete venularum supra plerumque inconspicuo subtus elevato. Inflorescentia axillaris, tenuis, pendula, utrinque dense vinaceo- mox castaneo-tomentosa, pauciflora, paniculata, bracteolata, ad 7 cm longa, longo-pedunculata. Flores dioici, ♀ immaturi, ad 2.5 mm, ut videtur brevipedicellati, perianthio campanulato pubescentes, lobis ±1.9 mm longis ovatis intus sparse pubescentibus, tubo brevi ±0.6 mm longo, staminibus sterilibus ser I & II filamentis inclusis, ut videtur suborbicularibus, ±0.75 mm longis, filamentis indistinctis expansis, staminibus sterilibus ser III ±0.8 mm longis, filamentis distinctis biglandulosis antheris quam ser I & II minoribus, ser IV brevissime longiacuto, pubescenti; gynoecio ad 1.6 mm longo, ovario subovoideo glabro quam stylo crasso majore, stigmate conspicuo bilobato. Flores ♂ et infructescentia fructusque ignoti.

Type. Shrub 1.5 m, rare on east escarpment slope, Cañon Grande, below Cumbre Camp, Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, 1650 m, 26 Nov 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42244* (holotype, ♀ fl. NY).

Distribution. Known only from the type collection.

The weak habit of the shrub is noteworthy. The leaves with glaucous under surface, showing unusual lateral nerves which originate approximately at right angles to the costa and branch more acutely towards, and presently arch abruptly near the margin, are characteristic. Especially striking is the wine-colored tint visible on the young branch-tips and inflorescences.

The wine or maroon (plum) color of the pubescence may not be due entirely to the pubescence per se but in part to the color of the apical portion of the young shoots and to that of the apex and very young rhachis of the inflorescence. The fact that the branchlets become progressively darker with age, as is commonly noted in the family, and bear pubescence ranging from castaneous near the apex to brunneous on older portions, tends to bear out this statement.

The general habit suggests that of *Ocotea declinata* (Meissner) Mez, but the floral pattern indicates it definitely as a member of the genus *Endlicheria*. The sterile stamens of the first two outer cycles are expanded to a subpetaloid condition, with no discrete filaments apparent. They bear on their introrse surface, laterally near the base, two scalelike flaps closely adhering, seemingly attached marginally. A similar condition is noted in a new species of the genus *Ocotea*

described below, also from Cerro de la Neblina. These structures seen in both genera recall also vaguely the flowers of *Dicypellium*. Both of the latter genera, however, bear stamens with four-celled anthers.

Endlicheria sprucei (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 125. 1889.

Goeppertia sprucei Meissner in DC. Prodr. **15**¹: 172. 1864.

Type. Prope Panuré ad Rio Uaupés, Rio Negro, Amazonas, Brazil, *Spruce 2769* (isotype, ♂ fl. NY).

Distribution. A tree, or shrub? described from the Rio Vaupés region of Amazonian Brazil and reported from Loreto, Peru. BRAZIL. Amazonas: tereno silicoso, bordade Caatinga, Jauareté, Vaupés, Rio Negro, *Froes 21211* (♀ fl. NY).

The pistillate specimen was collected by Froes a few miles west of the type locality at the outermost point along the Rio Negro penetrated by Spruce. Apparently the latter did not find the species in that area, for we have no collection made by him there.

Endlicheria gracilis Kostermans, Meded. Bot. Mus. Utrecht **42**: 528. 1937.

Endlicheria grisea Kostermans. Reinwardtia **6**: 285, *fig. 3.* 1962. (holotype, ♀ fl. *WB 454* (*5864*) K; isotype, NY).

Type. Small tree, fruit black, vicinity of Barranca Bermeja, between Sogamoso and Colorado Rivers, Magdalena Valley, Department of Santander, Colombia, 100–500 m, 14 Nov 1934, *Oscar Haught 1414* (isotype, ♀ fl. NY).

Vernacular Names. Muneu-yek (Steyermark): Iro, Silberballi (Br. G.)

Distribution. Small tree widely occurring, besides in the type locality, in Venezuela, east on the sandstone areas of the Río Orinoco and its tributaries in Amazonas, in the Kavanayén region in Bolívar; and in the rainforest of the Kanuku Mountains in British Guiana. VENEZUELA. Amazonas: in dry woodland at edge of Culebra savanna, Río Cunucunuma, *Maguire, Cowan & Wurdack 29436* (♀ fl. NY); Bolívar: selva de Oparumá, Kavanayén, *Lasser 1881* (♀ fl. F, US); lower portion of Quebrada O-paru-má, between Santa Teresita de Kavanayén and Río Pacairao (tributary of Río Mouak), *Steyermark 60428* (♀ fl. fr. F). BRITISH GUIANA. Swamp forest remnant by Mission field, *For. Dept. Brit. Guiana, G 233* (*7209*) (fr. NY).

This is one of several instances of a disjunct distribution where a taxon is common to the sandstone, the Amazon, and the cordilleran areas of northern South America. Isotypes of both species described by Dr. Kostermans are before me. Any visible difference between them seems to be well within the latitude of variation frequently found in species of lauraceous genera. Examination of the isotypes does not disclose the differences which a comparison of the original descriptions would indicate. There remains the possibility, however, that there has been an error in numbering the sheets. This species, by an odd coincidence, superficially resembles very strongly *Ocotea gracilis* (Meissner) Mez, but on examination of the flower is immediately placed in *Endlicheria*. The leaves of the *Ocotea* have longer caudate tips than those of the above species. *Endlicheria gracilis* apparently has no close relatives within the genus.

Endlicheria bracteolata (Meissner) C. K. Allen, stat. nov.

Goeppertia sericea Nees var. *bracteolata* Meissner in DC. Prodr. **15**¹: 174. 1864.

Type. Prope San Carlos, ad Río Negro, Amazonas, Venezuela, 1853–54, *Spruce 3092* (isotype, ♂ fl. NY).

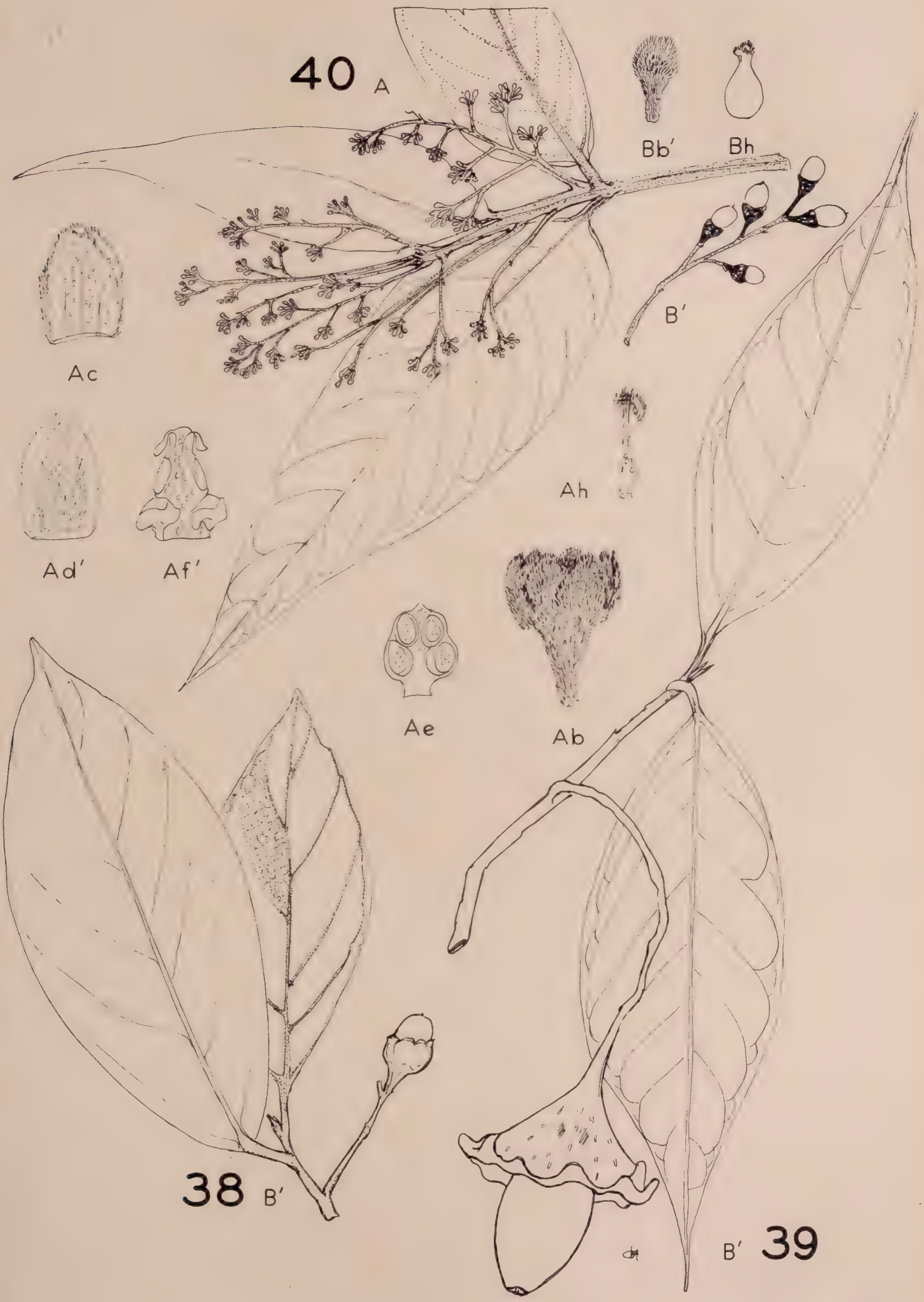


FIG. 38. *Endlicheria nilssonii* (*Steyermark & Nilsson 255*). B′, fruiting branchlet, × 0.5. FIG. 39. *Endlicheria wurdackiana* (*Wurdack & Adderley 43592*). B′, fruiting branchlet, × 0.5. FIG. 40. *Ocotea lasseriana* (A–Af, *Lasser 1868*; Bb–Bh, *1636*; B′, *Bernardi 6718*, fr.). A, habit, flowering branchlet, × 0.5. Ab, flower, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Ah, aborted ovary. Bb′, flower-bud, × 5. Bh, ovary, × 10. B′, fruiting branchlet, × 0.5.

Distribution. Small tree to 20 m, conspicuous for its subtriplinerved, yellow-green leaves, sericeous on the lower surface, occurring principally in sandstone areas of Brazil, Venezuela, British Guiana, and Suriname, and adjacent areas usually in woods along streams at an altitude from 100–200 m. VENEZUELA. Amazonas: en la margen de la selva alta, a lo largo del Río Negro, casi al frente de la bifurcación del Casiquiare, con el Guainía, *Williams 14788* (fr. A); along Yavita-Pimichín Trail, near Pimichín, Río Guainía, *Maguire, Wurdack & Bunting 36314* (♀ fl. NY); along Caño Asisa just downstream from Parú savanna camp, Río Ventuari, *Cowan & Wurdack 31529* (fr. NY); in mixed forest near Base Camp, Cerro Sipapo (Paráque), *Maguire & Politi 28380* (fr. NY); frequent on river banks above Cuao Creek, Río Orinoco, *Maguire & Politi 27384* (♀ fl. NY), along Río Cuao, *28159* (y. fr. NY); Bolívar: en el margen de la selva en la orilla del Caura, Salto de Para, Medio Caura, *Williams 11348* (fr. F). BRAZIL. Amazonas: mata margem esquerda do Vaupés, Jauareté, Vaupés, Rio Negro, *Froes 21243* (♂ fl. NY); silva non inundabili loco arenoso humido, Estrado do Aleixo, Manáos, *Ducke 1733* (♂ fl. A, NY). BRITISH GUIANA. Occasional in Morabukea forest, Paruima Falls to Paruima Mission, Kamarang River, Wenamu Trail, *Maguire & Fanshawe 32463* (♂ fl. NY); Makreba Falls, Kurupung River, Upper Mazaruni Region, *Pinkus 263* (fr. NY). SURINAME. Diabasic soil, mixed high forest, hill no. 1, Tafelberg (Table Mountain), *Maguire 24712* (♂ fl. NY).

This taxon has been treated heretofore as conspecific with *E. sericea* Nees, the much-collected species from the Antilles, and superficially resembles it. Close examination of Meissner's variety γ *bracteolata* discloses significant and consistent differences; namely, the less rigidly coriaceous leaves, distinctly subtriplinerved, with a lack of prominent nerves branching from the costa in the upper portion, or these, if present usually but not always, obscure. In general, the flowers are less coarse and the pedicels more slender.

Endlicheria nilssonii C. K. Allen, sp. nov. Fig. 38.

Arbor ad 30 m alt., gemmis ovoideis acutis robustis minute adpresseque pubescentibus, ramulis striatis ± angulatis mox teretibus juventute minute adpresseque fulvo-pubescentibus, mox atro-rubescentibus, glabrescentibus. Folia alternata, petiolis crassis pubescentibus glabrescentibus striatis teretibus, 10–12 mm longis et 1.5–2 mm latis; laminis utrinque sparse pubescentibus glabrescentibus, supra costa subtus costa venisque exceptis, rigide coriaceis, supra viridibus opacis subtus pallidioribus, ellipticis, 9–15 cm longis et 3.7–6.3 cm latis, ad basim acutis, ad apicem breviter acuminatis raro rotundatis emarginatisque, penninerviis, costa striata dense pubescenti ad basim aliquantum crassa, supra subplana subtus elevata, nerviis ad 4-paribus subtus glabrescentibus ad basim suboppositis alibi alternatisve, supra ± obscuris subtus tenuibus luteis fide coll., pubescentibus, ad angulo 35° divergentibus, rete venularum supra obscure subtus tenuiter pallido-pubescenti. Inflorescentia ignota. Infructescentia ad 5 cm longa minute fulvo-pubescens. Fructus immaturus, pallide viridis fide coll., subovoideus, apice rotundatus, apiculatus, ad 10 × 9 cm, cupula viridi obscure vino-rubescenti suffusa fide coll., cyathiformi ad 7 mm longa et ad 13 mm diam., margine irregulariter dentata, dentis scariosis, probabiliter mox deciduis, pedicello incrassato ad 8 mm longo apice ad 5 mm diam., pubescenti striato subtenta.

Type. Tree 30 m, leaves rigid, coriaceous, deep green above with sulcate nerves, pale green beneath with elevated buff-yellow nerves; fruiting calyx green suffused with dull wine color, immature fruit pale green; wooded ridge, fila La Danta, along provisional carretera from km 125 to 127, between Luepa and Cerro Venamo, Bolívar, Venezuela, 1200 m, 17 Apr 1960, *J. A. Steyermark & S. Nilsson 255* (holotype, fr. NY).

Distribution. Known only from the Guayana area of southeastern Venezuela.

The yellowish-green of the leaves at first glance relates this species to the genus *Aiouea,* so many of which display this distinctive leaf color. The general structure and venation, however, place it as a probable representative of *Endlicheria,* not far removed from the more southern, widespread species *E. paniculata* (Spr.) Macbride [*E. hirsuta* (Schott) Nees]. The fruit, even in the immature stage, shows characteristics of those often found in *Endlicheria.*

Endlicheria pyriformis (Nees) Mez, Jahrb. Bot. Gart. Berlin **5**: 116. 1889.

Cryptocarya pyriformis Nees, Syst. Laurin. 220. 1836.

Type. Guiana gallica, *Poiteau* [*58*] (isotype, fr. NY).

Distribution. Shrub or tree of varying height, occurring in forests along streams in French and Dutch Guiana, and reported from the Amazon Basin as far west as Peru. SURINAME. On ferrite-laterite, Line A, forested east slopes of Plateau B, Nassau Mountains, Marowijne River, *Maguire 40775* (fr. NY), *40790* (fr. NY).

A species conspicuous for the usually yellowish-green branchlets and petioles, and leaf-blades that are chartaceous and very nearly concolorous, with coarse, yellowish venation. The black (in the dried state) fruit is ellipsoid, 25 × 14 mm, enclosed one-fourth to one-third its length in a pateriform, subhemispherical, red (according to the collector) cupule, with somewhat undulate margin, borne on an expanded, obconical pedicel about 15 mm in length.

Endlicheria wurdackiana C. K. Allen, sp. nov. Fig. 39.

Arbor ad 8 m alt., gemmis parvis minute adpresseque fulvo- vel griseo-pubescentibus, ramulis rubescentibus mox maculoso-griseis subteretibus glabris. Folia alternata, petiolis satis tenuibus glabris rubescentibus ± teretibus, ad 20 mm longis et 2 mm latis, laminis utrinque glabris tenuiter membranaceis utrinque viridibus ellipticis, (9–) 15–19 cm longis et (3.5–) 5–5.3 cm latis, ad basim acutis, ad apicem longe acuminato-caudatis, acumine tenui, ad 3.5 cm longo, penninerviis, costa ad basim rubescenti, supra leviter subtus conspicue elevata, utrinque pallide lutescenti, nervis 6–9-paribus supra inconspicuis subtus conspicuis, tenuibus leviter elevatis, ad angulo 55–45° divergentibus, rete venularum utrinque conspicuo tenui, subtus pallide lutescenti. Inflorescentia ignota. Infructescentia axillaris, satis crassa, glabra, ad 12 cm longa, ut videtur pendula, rubescenti-brunnea. Fructus viridis fide coll., oblongus, apice rotundata, ad basim ± subrotundatus, ± truncatus, ad 37 × 20 mm, cupula tenui latissime vadeque campanulata undulata tenuiter lobata, ad 3.5 cm longa, 3 (–4) cm diam. et 1.5–2 cm alt., stipite crasso 1.5–2 cm longo, pedicello ad 2 cm longo rubro.

Type. Tree 8 m, cupule red, fruit green, along Río Siapa between Raudal Gallineta and Salto Gallineta (about 110–130 river km from mouth), Amazonas, Venezuela, 130–150 m, 23 Jul 1959, *J. J. Wurdack & L. S. Adderley 43592* (holotype, fr. NY).

Distribution. Known only from the type locality in the Guayana area of lower Venezuela.

A striking species with seemingly pendulous, large-fruited infructescences, the green fruit subtended by a red cupule, borne on somewhat slender, greyish branchlets, contrasting with the blackish petioles of the shining, pale green, thin leaves with conspicuous drip-tips. Because of the lack of flowering material, it is not certain that the species belongs in *Endlicheria*. Possibly the nearest alliance in this genus may be with *Endlicheria pyriformis*, treated above, which bears greenish branchlets and leaves that are broader, more oblong, shorter, with attenuate, obtuse tips usually not longer than 1 cm, and smaller fruit and cupule, borne on greenish pedicels. It calls to mind, also, *Endlicheria* (*Huberodaphne*) *longicaudata* (Ducke) Kostermans, and may belong to this group which has a floral structure distinct from that of any known *Endlicheria* species, if indeed it is correctly placed in that genus. The leaves of the latter, however, are unique in that they are distinctly oblong and blunt at both ends, the exceptionally long, caudate tip being subequal in width throughout its entire length.

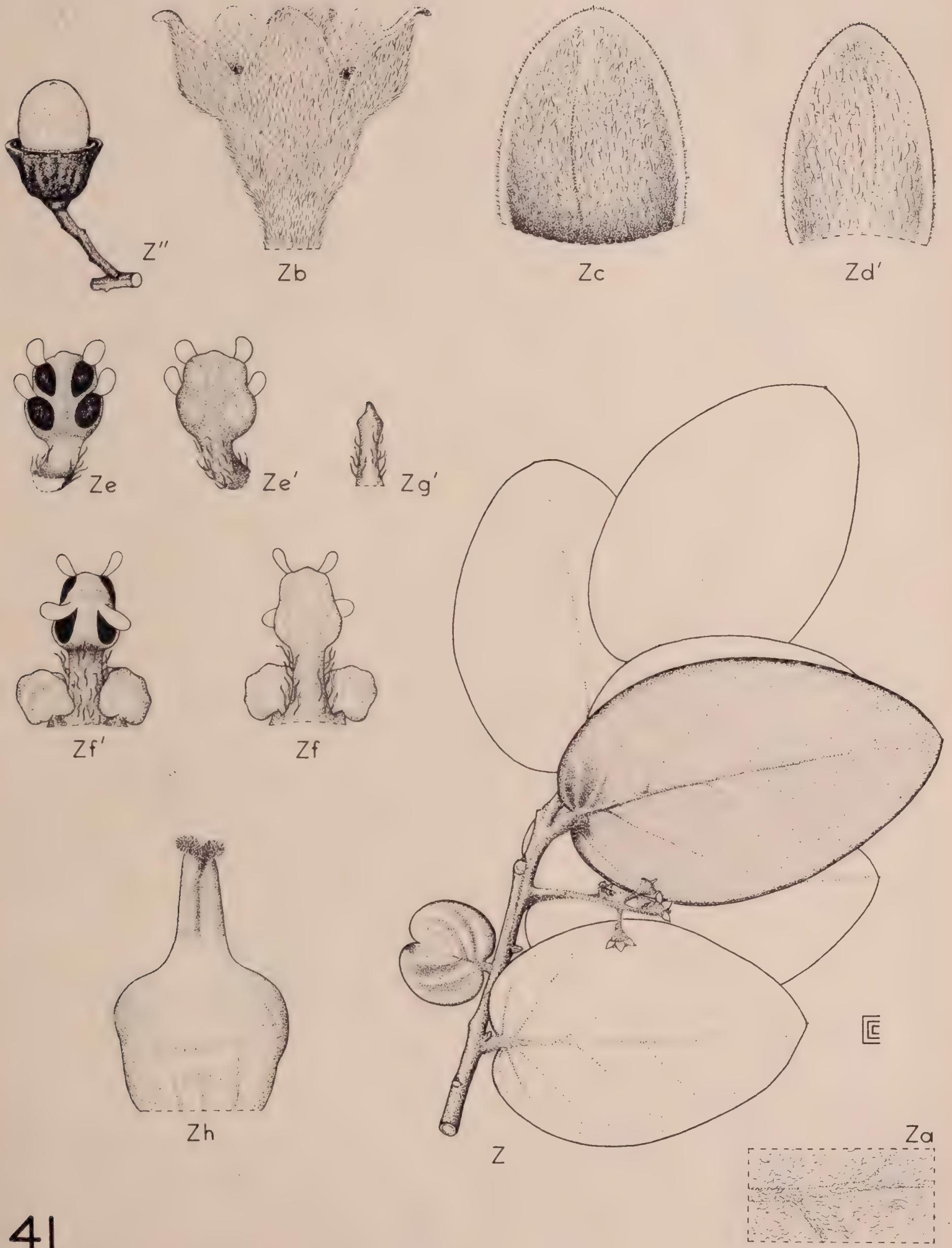
Endlicheria maguireana C. K. Allen, sp. nov. Fig. 42.

Arbor ad 12 m alt., ramulis teretibus, ad apicem leviter angulatis glabrescentibusve, pubescentibus leviter lucidis. Folia alternata, longe petiolata, petiolis aliquantum robustis rubescentibus canaliculatis, ad 25 mm longis et 2.5 mm latis, laminis utrinque glabris, subtus minute conspicue denseque punctulatis, aliquantum subcoriaceis, utrinque luteo-viridescentibus, ellipticis, ad basim acutis subrotundatisve, ad apicem ± abrupte breviter obtuseque acuminatis, penninerviis, costa crassa supra leviter elevata ad petiolum plana lateriorque, subtus conspicue elevata utrinque pallide rubescente, nervis ad 7-paribus, pallide rubescentibus gracilibus, supra ± planis subtus leviter elevatis, ad angulo 55° divergentibus, rete venularum utrinque inconspicuo. Inflorescentia axillaris, fragilis, glabra vel sparse pubescens, late paniculata, ad 20 cm longa, longe pedunculata, subumbellata, 2- vel 3-floribus rachidum longarum tenuiumque ad apices, pedunculo ad 10 cm longo. Flores dioici, ♀ ad 4–7 mm longi, longe pedicellati, pedicello gracili ad 4.5 mm longo; perianthio tenui campanulato viridescentialbo, lobis ovatis, extus sparse intus densiori pubescentibus, ad apicem praecipue, ad 1.3 mm longis, tubo quam lobis leviter breviore; staminibus sterilibus ser I & II ±1 mm longis, tenuiter membranaceis, antheris ovatis, connectivo locellos magnos superanti, filamentis quam antheris brevioribus, ser III sterilibus? obovatis ± truncatis, biglandulosis, glandulis stipitatis, ser IV 0; gynoecio glabro, ad 2.8 mm longo, ovario late ellipsoideo, stylo haud crasso quam ovario breviore, stigmate patenti ± orbiculari, 3-lobato. Flores ♂, infructescentia, et fructus ignoti.

Type. Tree 12 m, flowers greenish-white, occasional along banks of Cañon Grande River, SSE of Cumbre Camp, Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, 1100–1150 m, 26 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42521* (holotype, ♀ fl. NY).

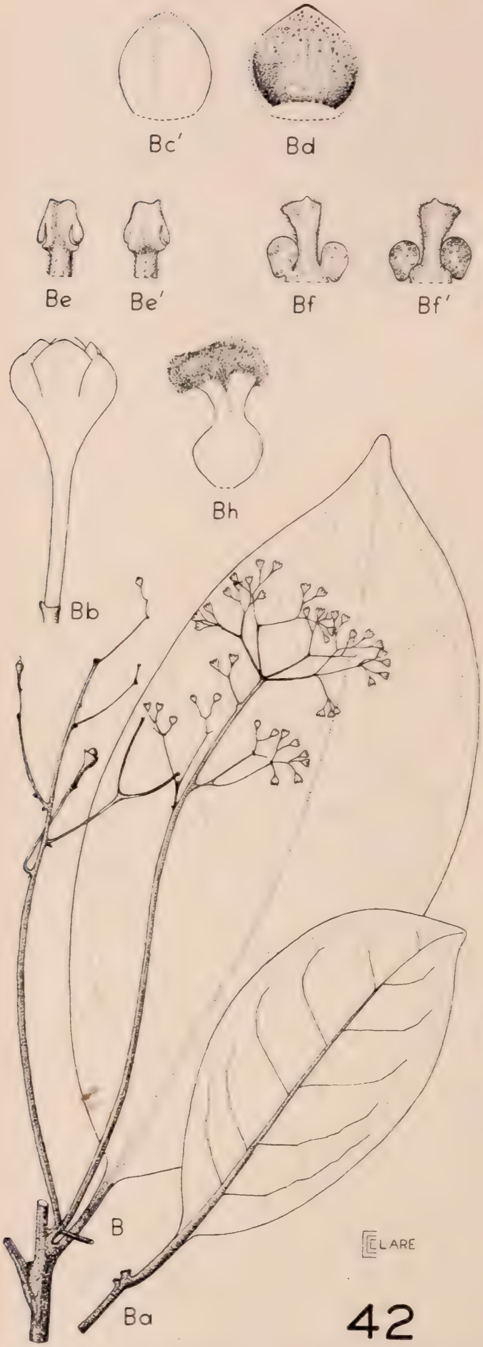
Distribution. Known only from the type locality in the endemic sandstone area of Cerro de la Neblina, of southern Venezuela.

The yellow-green, perfectly elliptic leaves of this species are in strong contrast with the loosely flowered, exceedingly slender, tenuous inflorescences. Again, it is difficult to relate this to any of the known species of the genus. The leaves and habit of the inflorescences strongly suggest *Aiouea*, but the flowers are typical of *Endlicheria*.

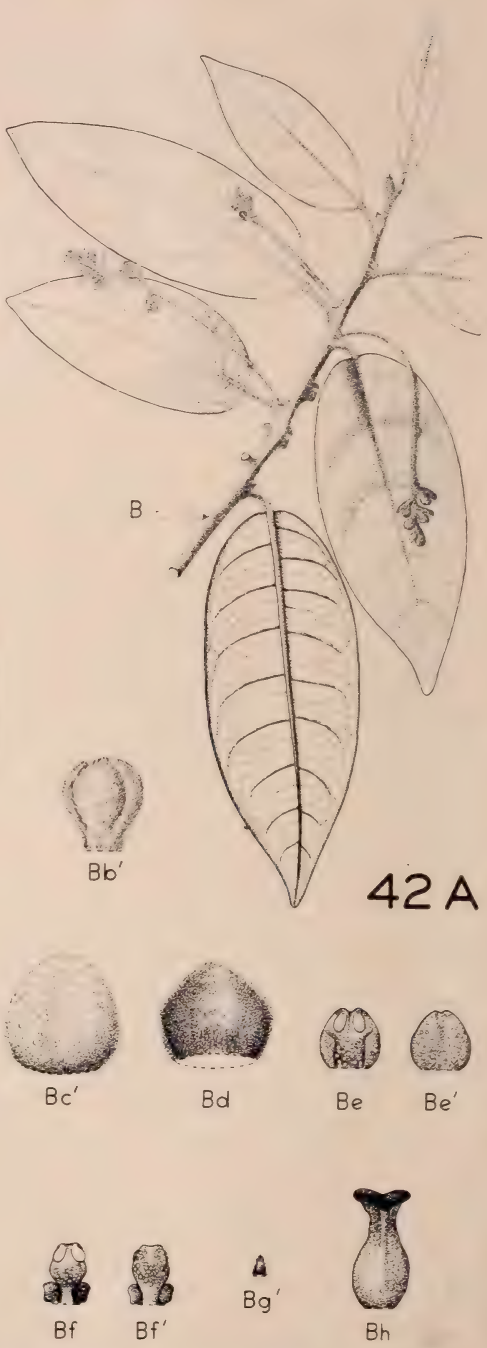


41

FIG. 41. *Phoebe steyermarkiana* (Z–Zh, *Steyermark & Wurdack 921; Z″, Wurdack, 34234*). Z, habit, flowering branchlet, × 0.5. Za, leaf-surface section, upper, × 5. Zb, flower, × 5. Zc, tepal, ser I, ventral, × 10. Zd′, tepal, ser II, dorsal, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze′, stamen, ser I & II, dorsal, × 10. Zf, stamen, ser III, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zg′, staminodium, × 10. Zh, ovary, × 10. Z″, fruit, × 0.5.



42



42 A

FIG. 42. *Endlicheria maguireana* (*Maguire, Wurdack & Maguire 42521* ♀). B, habit, ♀ flowering branchlet, × 0.5. Ba, leaf, under surface, × 0.5. Bb, flower, × 5. Bc′, tepal, ser I, dorsal, × 10. Bd, tepal, ser II, ventral, × 10. Be, sterile stamen, ser I & II, ventral, × 10. Bf, sterile stamen, ser III, ventral, × 10. Bf′, sterile stamen, ser III, dorsal, × 10. Bh, ovary, × 10. FIG. 42A. *Endlicheria vinotincta* (*Maguire, Wurdack & Maguire 42244* ♀). B, habit, ♀ flowering branchlet, × 0.5. Bb′, tight bud, × 5. Bc, tepal, ser I, ventral, × 10. Bd′, tepal, ser II, dorsal, × 10. Be, sterile stamen, ser I & II, ventral, × 10. Be′, sterile stamen, ser I & II, dorsal, × 10. Bf, sterile stamen, ser III, ventral, × 10. Bf′, sterile stamen, ser III, dorsal, × 10. Bg′, staminodium, × 10. Bh, ovary, × 10.

Systemonodaphne mezii Kostermans Meded. Bot. Mus. Utrecht **46**: 105. 1938.

> *Systemonodaphne geminiflora* (Meissner) Mez in Jahrb. Bot. Gart. Berlin **5**: 79. 1889, quoad *Martin 45*.

Type. French Guiana, *Martin 45* (holotype, fl. B, fragm. NY).

Vernacular Name. Louro (Cowan).

Distribution. Small tree or shrub from 5 to 6 m, bearing hermaphrodite flowers, and occurring in heavily forested hills up to 300 m, in northern Brazil, Suriname, and French and British Guiana. BRAZIL. Territorio do Amapá: occasional in forest of slopes of Macaco Ore Body, *Cowan 38167* (fr. NY), frequent in forest on slopes to Igarape Sentinela, Curuca Ore Body, *38182* (fr. NY). BRITISH GUIANA. Essequibo Basin, in dense forest along Orono Creek near mouth, lat. about 1° 35′ N, *A. C. Smith 2667* (fr. NY).

A little-collected genus, known to me in the flowering stage only from a fragment of the type-collection. It is characterized by rather slender branchlets bearing chartaceous, elliptic, obtusely acuminate leaves usually not more than 10–12 cm in length, with a prominent, yellowish midrib. The fruits of the numbers cited above are rather more ellipsoid than ovoid, as described by Kostermans apparently from the Poiteau specimens he cites which I have not seen.

Persea steyermarkii [16] C. K. Allen, Jour. Arn. Arb. **26**: 286. 1945.

Type. Guatemala, *J. A. Steyermark 37061* (holotype: F, fragment at A).

Vernacular Name. Aguacate de montana.

Distribution. The mountain slopes of Guatemala and El Salvador, 1300–4000 m. VENEZUELA. Amazonas: Río Atabápo, common at edge of small laja, Río Temi 1 hour below Yavita, 100 m, *Maguire 29342*.

Until the above collection was made, this species was found only in Guatemala and El Salvador. With its rather limited distribution it was surprising to find it collected in Venezuela and to have it noted as being common in this locale. A close relative of *Persea americana,* the common avocado, *P. steyermarkii* probably has an edible fruit and was carried at some time by man along the water route up the Orinoco to its present location much as the more widely distributed *P. americana* has been.

Persea fastigiata Kopp, sp. nov.

Arbuscula 8–10 m; ramuli angulares, moderate strigulosi, cortice sine odore; petioli 1–2 cm longi, canaliculati, crassi, dense strigulosi vel strigosi; laminae 12–15 (–20) cm longae, 4–5.5 (–8) cm latae, coriaceae, oblanceolatae vel raro ellipticae, apice acuto usque ad acuminatum, basi cuneata, superficie superiore glabra, inferiore sparse strigulosa (sericea in var. *sericeae*), marginibus leviter usque ad valde revolutos, costa supra impressa, infra prominenti, venis primariis (8–13 jugis) ex angulo 55–60° divergentibus, supra impressis, infra prominentibus, venulis utrinque obscuris. Inflorescentia sessilis vel subsessilis, angusta, axillaris et subterminalis, longitudine tertiam partem foliorum subtendentium aequans, multiflora, paniculata, strigosa (pilosa in var. *pilosae*), ramulis erectis; pedunculi 0–0.5 cm longi, crassi, strigosi vel strigulosi, rachide brevi, adpressa, fulvo-pubescenti (longioriter pilosa in var. *pilosae*); pedicelli 2–3 mm longi, dense fulvo-strigosi; flores 4–5 mm longi; perianthii segmenta exteriora 2 mm

---

[16] The genus *Persea* contributed by Lucille E. Kopp.

longa, 1.6 mm lata, ovata, externe dense fulvo-strigosa, intus glabra; perianthii segmenta interiora 4 mm longa, elliptica, utrinque dense fulvo-strigosa; serierum I et II filamenta 1.7 mm longa, strigulosa, antheris 1 mm longis, oblongis, retusis, quadrilocularibus; seriei III staminodia (fertilia in var. *sericeae*) 3.1 mm, strigosa, glandulis in tertia parte basilari staminodiorum adnatis; seriei IV staminodia sagittata setis terminalibus munita; gynoecium glabrum, ovario 1 mm longo, globoso; stylus 1.5 mm longus, angustatus; stigma peltatum. Infructescentia fructibus paucis; perianthii segmenta patentia usque ad involuta, omnino persistentia; fructus globosi, glauci, stylo persistente.

Persea fastigiata var. **fastigiata**.

A var. *pilosa* et var. *sericea* foliis plerumque oblanceolatis, sparse strigulosis, marginibus leviter recurvatis, rachide sparse fulvo-strigosa, seriei III staminodiis differt.

Type. Cerro Huachamacari, Río Cunucunuma, Amazonas, Venezuela, 11 Dec 1950, *Bassett Maguire, R. S. Cowan, & John J. Wurdack 30130* (holotype, NY).

Distribution. Found on the summit of Cerro Huachamacari and summit and slopes of Cerro Neblina, sandstone mountains of southern Venezuela. Amazonas. Cerro Huachamacari: occasional in vicinity of Summit Camp, 1800 m, *Maguire, Cowan, & Wurdack 30019;* flowers cream-colored, W rim of Ridge I between Summit Camp and east escarpment, 1850 m, *Maguire, Cowan, & Wurdack 30130;* tree 10 m, inflorescence reddish, occasional in vicinity of Summit Camp, 1800 m, *Maguire, Cowan, & Wurdack 30199.* Cerro de Neblina: uppermost escarpment slopes south of Camp 3, 1700 m, *Maguire, Wurdack, & Bunting 36958;* banks of Caño Grande SSW of Cumbre Camp, 1050–1100 m, *Maguire, Wurdack, & Maguire 42497.*

Persea fastigiata var. **pilosa** Kopp, var. nov.

A var. *fastigiata* et var. *sericea* foliis oblanceolatis usque ad elliptica, sparse strigulosis, marginibus valde revolutis, rachide dense fulvo-pilosa, seriei III staminodiis differt.

Type. Chimantá Massif, Torono-tepuí, along Río Tirica, Bolívar, Venezuela, 1925 m, Mar 1955, *Julian A. Steyermark & John J. Wurdack 1240* (holotype, NY).

Distribution. Summit of Cerro Chimantá in southern Venezuela. Bolívar: Chimantá Massif, zanjon near edge of escarpment above Middle Falls of Río Tirica below Summit Camp, 1925 m, *Steyermark & Wurdack 451;* Ptari-tepuí, along base of south-facing high sandstone bluffs, 2410 m, *Steyermark 59909* (F); Chimantá-tepuí (Torono-tepuí) above valley of Río Tirica, 1000–1700 m, *Steyermark 75447* (NY).

Persea fastigiata var. **sericea** Kopp, var. nov.

A var. *fastigiata* et var. *pilosa* foliis oblanceolatis, sericeis, marginibus revolutis, rachide sericea, antheris seriei III quadrilocularibus, locularibus superioribus vestigialibus differt.

Type. *Bonnetia* forest at northwest head of Caño Grande, Cerro Neblina, Amazonas, Venezuela, 2000 m, 8–9 Dec 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42321* (holotype, NY).

Distribution. Found on sandstone, Cerro Neblina in Venezuela and Cerro de Circasia in Colombia. COLOMBIA. Vaupés: Cerro de Circasia, tree 10 m, 300–500 m, *Cuatrecasas 7194* (US).

The longer leaves, more numerous pairs of lateral nerves, shorter pedicels, and smaller flowers are the characteristics that distinguish *P. fastigiata* from *P. hexanthera*, a closely related species. The stiff, erect, numerous branches of the inflorescence are characteristic of this species and distinguish it from the other members of this group.

Persea maguirei Kopp, sp. nov.

Frutex compactus ad 2 m alt.; ramuli non aromatici, teretes, cupreo-sericei, demum fusci; petioli 7–12 mm long., striati, cupreo-sericei; foliorum laminae 4.5–2.5 cm long., 1.5–2.5 cm lat., subchartaceae, ellipticae vel rare obovatae, apicibus plerumque acutis interdum ex obtusis ad rotundos, basibus acutis, superficie superiore glabra inferiore cupreo-sericea, costa supra plana infra prominenti, nervorum primariorum 7–9 jugis utrimque obscurorum, ex angulo 50–55° divergentium, reticulo utrimque obscuro. Inflorescentiae pauciflorae, graciles, axillares subterminalesque, dichasiales simpliciter compositeve, quam folium subtendens paullo longior breviores; pedunculus 3–4 cm long., gracilis, cupreo-sericeus; pedicelli 5–6 mm long., cupreo-sericei; flores 5 mm long.; perianthii segmenta exteriora 2 mm long., 2 mm lat., ovata, extra cupreo-sericea, intra glabra; segmenta interiora 4 mm long., 2.5 mm lat., cupreo-sericea extra intraque; stamina prope 3.2 mm long., filamentis circiter 1.8 mm long., antheris 1.5 mm long.; serierum I et II filamenta dense strigosa, antheris oblongo-ovatis, quadrilocularibus; seriei III filamenta dense cupreo-strigosa, glandulis sessilibus, stipitibus ad partem quartam basilarem filamentorum adnatis, antheris oblongis, lateraliter dehiscentibus, quadrilocularibus; seriei IV staminodia valida, setis terminalibus instructa; gynoecium ex parte pubescens, ovario 1 mm long., ellipsoideo, in parte superiore strigoso; stylo 2 mm long., gracili, stigmate peltato. Infructescentia non visa.

Type. Compact shrub 2 m, flowers brownish, along north escarpment above Culebra, Cerro Duida, Río Cunucunuma, Amazonas, Venezuela, 1400 m, 20 Nov 1950, *Bassett Maguire, R. S. Cowan, & John J. Wurdack 29599* (holotype NY).

Distribution. Known only from the type collection.

The combination of the pubescent ovary, quadrilocular stamens, and subsessile glands on the third series of stamens indicates a relationship with *P. jenmani*. The much smaller leaves and flowers, the more delicate general appearance, and the lighter-colored pubescence of *P. maguirei* will eliminate the possibility of confusion with *P. jenmani*.

Persea grandiflora Kopp, sp. nov.

Arbor ad 15 m alt.; ramuli crassi, dense fulvo-sericei; petioli 2.5–5 cm long., crassi, striati, dense fulvo-sericei; foliorum laminae 8–20 cm long., 3.5–10 cm lat., late ellipticae vel late ovatae, apicibus acutis, basibus acutis obtusisve, superficie superiore glabrescenti, interdum nitida, inferiore fulvo-sericea, costa supra leviter impressa, nervorum primariorum 7–9 jugis ex angulo 45–50° divergentium, supra planorum, infra prominentium, venulis obscuris. Inflorescentiae axillares subterminalesque, angustae, quam folium subtendens longiores; pedunculi 0–2 (–6) cm long., fulvo-sericei; pedicelli 1–4 mm long., dense fulvo-sericei; flores 9–10 mm

long.; perianthii segmenta exteriora 5 mm long., 4 mm lat., late ovata, extra fulvo-sericea, intra glabra; segmenta interiora 9 mm long., 4.5 mm lat., oblonga, utrimque fulvo-sericea; stamina 5.5 mm long., filamentis 4 mm long., antheris 1.5 mm long.; serierum I et II filamenta dense pubescentia, antheris quadrilocularibus; seriei III filamenta gracilia, pubescentia, glandulis subsessilibus ad partem quintam basilarem filamentorum adnatis, antheris quadrilocularibus; seriei IV staminodia late sagittata, setis terminalibus instructa; gynoecium sparse pubescens, ovario globoso, supra sparse pubescenti, stylo 3 mm long., pubescenti, stigmate peltato. Fructus ignotus.

Type. Tree 10–15 m, buds tawny, Caño Grande east of Cumbre Camp, Cerro de Neblina, banks of Río Yatua, Amazonas, 24 Nov 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42191* (holotype NY).

Distribution. VENEZUELA. Amazonas: Cerro de Neblina, *Clusia* tangle just S of Camp 3, 650 m, *Maguire, Wurdack, & Maguire 42557.*

The leaf-shape, the short peduncles, the general appearance, and the distribution suggest a relationship to *P. jenmani;* but the large leaves with their appressed tawny pubescence, the large flowers, and the pubescent ovary readily separate *P. grandiflora* from *P. jenmani.*

Phoebe steyermarkiana C. K. Allen, sp. nov. Fig. 41.

Arbor ad 10 m alt., raro arbustum depressum, ad 3 m alt., gemmis robustis ovoideis ± apiculatis dense ferrugineo-tomentosis, ramulis robustis juventute adpresse ferrungineo-tomentosis, mox glabrescentibus atratis. Folia alternata adscendentia, petiolis robustis ad apicem intumescentibus, brevibus, 3–5 mm longis, breviter canaliculatis tomentosis mox glabrescentibus, laminis supra atrovirentibus glabris subtus argenteo-griseo-viridibus, e fulvo- ad ferrugineo-brunneo-tomentosis, coriaceis late ovatis, ut videtur concavis, (5–) 10 (–11) cm longis et (4.5–) 6–7 cm latis, margine recurvatis, ad basim cordatis vel raro subrotundatis, ad apicem subrotundatis, obtusis vel emarginatis, penninerviis, costa robusta, supra leviter subtus prominentei elevata, ad basim subite intumescenti dense tomentosa, nervis 4–5-paribus supra glabris leviter subtus tomentosis conspicue elevatis, 1–2-paribus basilaribus descendenti-arcuatis, paribus superioribus adscendentibus, ad angulo 70–35° divergentibus. Inflorescentia robusta, axillaris vel subterminalis, ferrugineo-tomentosa, 5–6 cm longa, pedunculo et pedicello pallide viridi-ferrugineo-tomentosis. Flores hermaphroditi ad 5 mm longi pedicellati, dense tomentosi, lobis ellipticis vel ovatis ad 2.5 mm longis, tubo ad 1.5 mm longo; staminibus ser I & II ad 1.8 mm longis, antheris quam stylo satis robusto pubescenti leviter longioribus, ser III ovato-truncatis biglandulosis, glandulis ovatis ad basim et fere filamenta pubescentia et stipitata aequantibus, ser IV cordato-ovatis manifeste stipitatibus ad 1 mm longis; gynoecio glabro, ad 3 mm longo, ovario leviter obovoideo quam stylo robusto duplo longiori, stigmate conspicuo subtriangulari. Infructescentia crassa, glabra, ad 6 cm longa. Fructus ut videtur viridis, ellipsoideus, 3 × 2 cm, cupula cyathiformi rugosa ± duplo-marginata marginibus subaequalibus ad 1.5 cm longa ad marginem 3 cm lata, brevipedicellata, pedicellis robustis subtenta.

Type. Tree 7–8 m, leaves concave, coriaceous, deep green above, silvery grey-green below with fulvous- to ferruginous-brown tomentum, peduncles and pedicels pale green with brown to ferruginous tomentum, locally frequent in zanjones bordering rocky savanna above Upper Falls, between meanders of west

branch of headwaters of Río Tirica, Chimantá Massif, Bolívar, Venezuela, 2150 m, 17 Feb 1955, *Julian A. Steyermark & John J. Wurdack 921* (holotype, fl. NY).

Distribution. Small tree or occasionally depressed shrub of the drainages bordering rocky savannas or cumbres on slopes of sandstone mountains of Bolívar, Venezuela, from 2000 to 2400 m; and possibly in the high elevations in the Caroní. VENEZUELA. Bolívar: at base of upper escarpment, northwest cumbres, Churi-tepuí (Muru-tepuí), *Wurdack 34234* (fr. NY); on densely forested steep, south-facing slopes overlying sandstone, between "Cave Rock" and base of high sandstone bluffs, Ptari-tepuí, *Steyermark 59571* (fl. F); locally frequent along flat rocky stretches on north part of summit of Torono-tepuí, *Steyermark & Wurdack 1201* (y. fr. NY); cumbre del Cerro Acopán, Caroní, *Cardona 2275* (fl. US).

Superficially, this striking species resembles *Ocotea caesia* (Meissner) Mez from Brazil in the erect, cordate leaves with peduncles swollen at the base. The resemblance ends there, however, for the *O. caesia* is glabrous, the leaves are more elliptic, and the inflorescences are much longer than the leaves. The relationship of *P. steyermarkiana* within the genus is probably with *P. tetragona* (Meissner) Mez, with inflorescences longer than the glaucous leaves.

The species is named for Dr. Julian A. Steyermark, who has contributed much to the collections of Lauraceae from Venezuela, and indeed to a greater understanding of the flora as a whole of that region.

Phoebe areolatocostae C. K. Allen, sp. nov. Fig. 49.

Arbor ad 15 m alta, gemmis anguste ovoideis acuminatis fulvo- vel pallide ferrugineo-pubescentibus, ramulis juventute dense adpresseque fulvo-tomentosis, mox glabrescentibus, glabris, atratis teretibus striatis. Folia alternata, petiolis atratis gracilibus minute pubescentibus mox satis crassis glabrescentibus, ad 2 mm longis, laminis utrinque juventute supra sparse cinereo-pubescentibus subtus minute denseque cinereo-pubescentibus, mox glabrescentibus, supra minute papillosis in sicco olivaceo-viridiscentibus subtus pallide brunneis, ellipticis vel oblanceolato-ellipticis, (7–) 12–14 cm longis et (2.5–) 5–7 cm latis, ad basim acutis vel longo-acutis, ad apicem abrupte obtuseque acuminatis, acumine ad 8 (–10) mm longa, penninerviis, costa supra plus minusve atro-rubescenti gracili valde impressa, subtus crassa elevata, nervis ad 8-paribus rubescentibus arcuato-adscentibus, ad angulo 56–68° divergentibus, rete venularum supra laxo inconspicuo, subtus obscuro, utrinque ± minute areolato areolae ad costam praecipue maiora distinctae conspicuaeque. Inflorescentia axillaris aliquantum laxe paniculata, ad 8 cm longa, pedunculo 2.5–3.5 cm longa. Flores hermaphroditi ad 5 mm longi, dense fulvo-pubescentes, perianthio campanulato dense fulvo-pubescenti, eburneo fide coll., lobis ovatis acutis, exterioribus interioribusque subaequantibus, ad ±2 mm longis, tubo ad ±2 mm longo; staminibus ser I & II 1.5 mm longis, antheris attenuato-ovatis quam filamentis satis crassis pubescentibus leviter brevioribus, ser III ad 1.5 mm longis antheris quadrangularibus vel ovatis filamentis pubescentibus aequantibus, biglandulosis, glandulis satis magnis quam filamentis dimidium brevioribus, ser IV cordatis 0.6–0.7 mm longis pubescentibus stipitatis, gynoecio glabro ad 1.3 mm longo, ovario subobovoideo vel late ellipsoideo quam stylo gracili duplo longiori, stigmate ± lobato. Infructescentia immatura ad 8 cm longa satis gracilis atro-rubescens, glabrescens. Fructus immaturus viridis fide coll., ut videtur oblongus? cupula cyathiformi glabrescenti ad 8 mm longa et 6 mm in diam., ad marginem tepalis pubescentibus persistentibus ferenti, pedicello satis crasso ad 3 mm longo.

Type. Tree 15 m, buds and fruit green, occasional in slope forest, just north of Camp 3, Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, 650–700 m, 17 Nov 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42085* (holotype, fl., y. fr. NY).

Distribution. Tree from 4 to 15 m, known only from the type locality. VENEZUELA. Amazonas: *Maguire, Wurdack & Maguire 42572* (fl. NY).

The rather thinly chartaceous, elliptic leaves, with the veins ascending arcuately towards the margin at regular intervals and becoming confluent about 4–8 mm from the margin, are outstanding for their minute but rather conspicuous areolation, particularly noticeable at the midrib. The short, rather few-flowered, somewhat large inflorescences are densely cinereous, and the leaves are usually condensed near the tips, often leaving the branchlets bare for a large part of their length. It is impossible to predict the exact size and shape of the mature fruit; but from the young stage it would appear to be subtended by a subhemispherical cupule, and typical of the genus *Phoebe*, as is the flower. The alliance is with *Ocotea sericiflora,* rather than with any *Phoebe* from this area. It is separated from *O. sericiflora,* by the texture of the leaves with bases attenuately acute, and by minute reticulation, as well as by generic characters.

Ocotea aciphylla (Nees) Mez, Jahrb. Bot. Gart. Berlin **5**: 243. 1889.

Oreodaphne aciphylla Nees, Linnaea **8**: 43. 1833.

Type. São Paulo, Brazil, *Sellow, s.n.* (syntype? fl. B), *978* (isotype? F).

Distribution. Tree with hermaphrodite flowers, from 10 to 12 m, described from southern Brazil and reported generally from the interior and the upper Amazon, occurring in the Guayana areas of Venezuela and Suriname. VENEZUELA. Bolívar: wooded ridge of fila de La Danta, following the provisional carretera between campamento 125 and km 127 between Luepa and Cerro Venamo, *Steyermark & Nilsson 222* (fl. NY).

The greater portion of herbarium material seen was collected in central and southern Brazil. These collections are all characterized by sericeous flowers and lanceolate-acuminate leaves with the blade strongly recurved at the base. Mez described them as "ovate," but this is not true of the above-mentioned material. The type material of *Nectandra regnelli* Meissner (isotype, *Regnell III. 84,* fl. & lf. fragm. NY), from Minas Gerais differs by the lack of conspicuous staminodia. For the affinity of the species, see the following, *Ocotea costulata.*

Ocotea aciphylla var. **chimantaensis** C. K. Allen, var. nov.

A var. *aciphylla* differt foliis ellipticis vel leviter obovato-ellipticis, latioribus, ad basim leviter recurvatis.

Type. Tree 15 m, leaves chartaceous, dark green above, paler green below, pedicels greyish-green, petals and filaments white, anthers pale yellow, locally frequent at base of southwest-facing escarpment, Chimantá Massif, Amurí-tepuí, Bolívar, Venezuela, 1365 m, *Julian A. Steyermark & John J. Wurdack 1359* (holotype, fl. NY).

A survey of more material from the sandstone areas of Guayana may make it advisable to include this in var. *aciphylla* as another variant only. Scarcity of fruiting specimens, particularly in the northern limits of the range of *O. aciphylla,* adds further complication to delimitation of the species.

Ocotea costulata (Nees) Mez, Jahrb. Bot. Gart. Berlin **5**: 244. 1889.

Oreodaphne costulata Nees, Linnaea **21**: 320. 1848.

Vernacular Names. Laurel de tierra firme (Williams); Louro camfora, louro canfora (collectors here not cited).

Type. In Brittischen Guiana, *Rich. Schomburgk 987* (second of syntypes cited by Nees,[17] holotype, fide Mez; isotype, fl. US).

Distribution. Tree or shrub with hermaphrodite flowers described originally from British Guiana, believed to extend through Pará and Amazonas, Brazil, along the Amazon to Río Negro and Alto Orinoco of lower Venezuela. BRAZIL. Amazonas: prope San Gabriel da Cachoeira, ad Rio Negro, *Spruce 2093* (fl. GH, NY). VENEZUELA. Amazonas: en la selva alta de tierra firme de Tamatama, Alto Orinoco, *Williams 15136* (fl. A, F); forest at base of Piedra Arauicaua, Río Yatua, Casiquiare, *Maguire, Wurdack & Maguire 42615* (fr. NY).

Mez included in *Ocotea aciphylla Spruce 2093* from the Rio Negro region, which has leaves with blades that are larger, and consistently more full or rounded and undulate towards the base, never sharply, though often minutely recurved just above the petiole, giving the false appearance of being decurrent. This latter situation obtains consistently throughout the collections of *O. aciphylla.*

The following number may be an aberrant representative of *O. costulata*, for although the habit and general aspect are similar, the flowers show an instability of staminal structure, the tissues are extremely thin in some instances and the anther-cell structure indiscernible. Possibly this specimen has been subjected to insect-attack.

Shrub or small tree, leaves brittle, leathery, glaucescent below, involute, cupule red, fruit green, occasional on rock outcrop in open scrub-sedge savanna, Imbaimadai, Upper Mazaruni River, British Guiana, *Maguire & Fanshawe 32161* (fl., y. fr. NY).

Ocotea sericiflora C. K. Allen, sp. nov. Fig. 43.

Arbor ad 10 m alt., gemmis gracilibus attenuate lanceolato-ellipsoideis subfalcatis ad 6 mm longis fulvo-sericeis, ramulis teretibus, juventute minute fulvo-sericeis mox glabrescentibus, atratis, sparse lenticellatis. Folia alternata, petiolis robustis fulvo-pubescentibus mox glabrescentibus canaliculatis, ad 15 mm longis et 1.5 mm latis, laminis supra glabris, costa ad basim excepta, subtus minute praesertim ad basim sparse pubescentibus, subcoriaceis, ellipticis raro subobovatisve, 14–16 cm longis et 4.5–5 (–6.2) cm latis, ad basim conspicue revolutis decurrentibus acutis, ad apicem acute acuminatis, acumine ad 20 mm longa et ad basim 8 mm lata, penninerviis, costa supra inconspicua plana ad basim leviter subtus elevata, nervis 4–6-paribus utrinque gracillimis subtus perleviter elevatis, ad angulo 35° divergentibus, rete venularum minuto utrinque aliquantum obscuro. Inflorescentia axillaris vel subterminalis, gracilis, fulvo-sericea, paniculata, ad 10 cm longa, pedunculis 10–12 mm longis. Flores hermaphroditi, ad 7.5 mm longi, dense fulvo-sericei, pedicellis pubescentibus, gracillimis, ad 2 mm longis; perianthio albo campanulato, lobis ± carnosis, ad marginem submembranaceis, ad 3–3.5 mm longis, exterioribus ovatis, interioribus anguste oblongis, tubo ad 1.5 mm longo; staminibus ser I & II ad 1.5 mm longis antheris ovatis quam filamentis

---

[17] First syntype cited by Nees, *Schomburgk 929*, referred by Mez to *Nectandra pichurim* (H. B. K.) Mez. Both species bear leaves with conspicuously recurved bases.

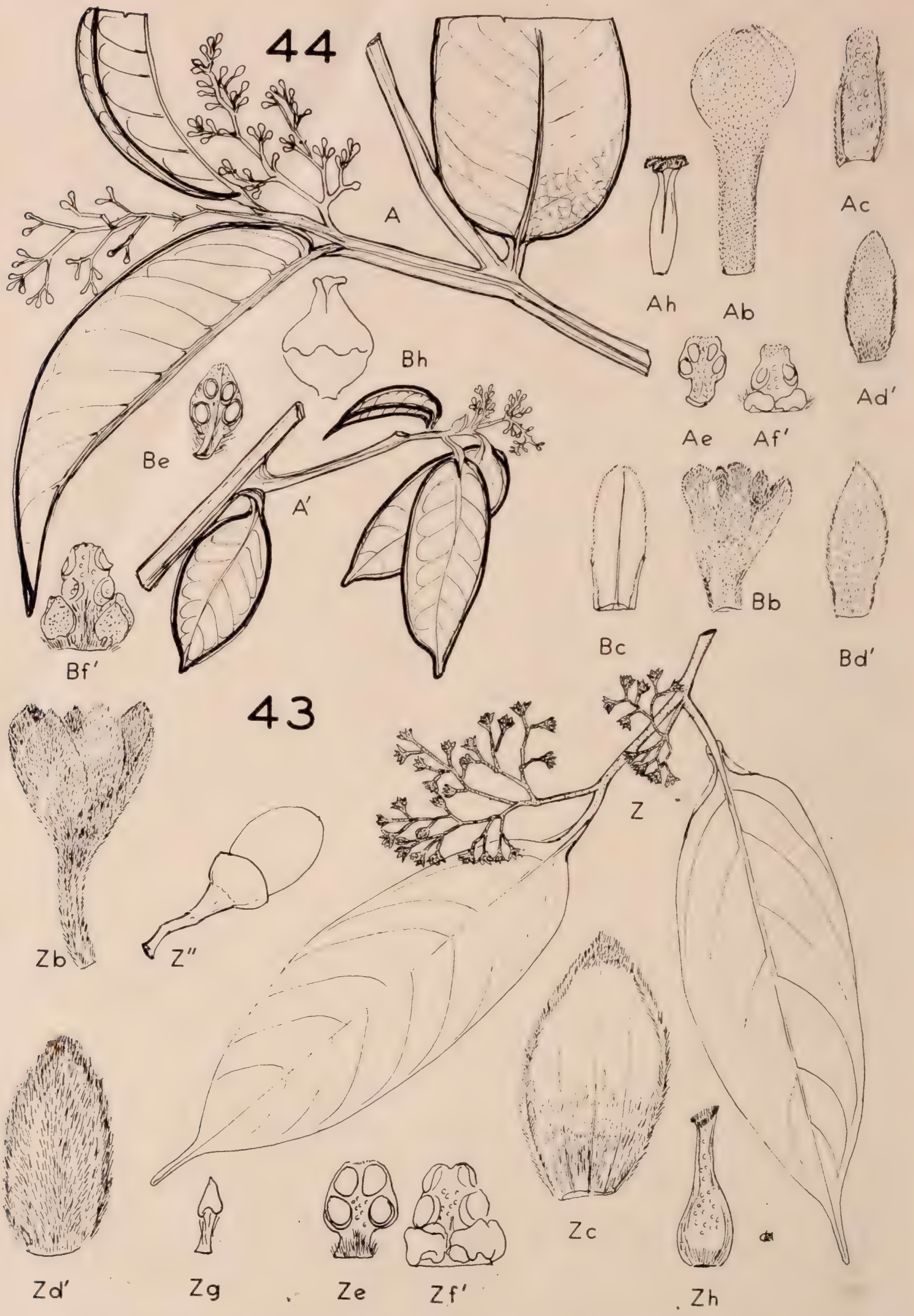


FIG. 43. *Ocotea sericiflora* (*Z–Zh, Maguire, Wurdack & Maguire 42482;* Z″, *42483*). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc, tepal, ser I, ventral, × 10. Zd′, tepal, ser II, dorsal, × 10. Ze, stamen, ser I & II, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zg, staminodium, ser IV, ventral, × 10. Zh, ovary, × 10. Z″, fruit, × 0.5. FIG. 44. *Ocotea atrata* (A–Ah, *Maguire & Politi 28340* ♂; A′, *Maguire 32916* ♂; Bb–Bh, *28654* ♀). A, habit, ♂ flowering branchlet, × 0.5 Ab, flower. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Ah, aborted ovary, × 10. Bb, flower, × 5. Bc, tepal, ser I, ventral, × 10. Bd′, tepal, ser II, dorsal, × 10. Be, stamen, ser I & II, ventral, × 10. Bf′, stamen, ser I & II, dorsal, × 10. Bh, ovary, × 10.

pubescentibus longioribus; ser III ad 1.5 mm longis, truncato-ovatis quam filamentis pubescentibus duplo longioribus, ser IV ad 1 mm longis triangularibus stipitem pubescentem aequantibus; gynoecio glabro ad 2 mm longo, ovario ovoideo quam stylo satis crasso leviter longiori, stigmate conspicue ± lobato. Infructescentia robusta, glabrescens, ad 7 cm longa, brunnescens. Fructus viridis fide coll., ellipsoideus, utrinque obtusus, apiculatus, ad 3 × 2 cm, cupula cyathiformi 1.5–2 cm longa et 1.7 cm diametro, rubro-brunnea fide coll., stipite obconico crasso ad 1 cm longo ad apicem 8 mm diametro, pedicello satis robusto 4–8 mm longo.

Type. Tree 10 m, flowers white, banks of Cañon Grande River, SSW of Cumbre Camp, Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, 1100 m, 24 Dec 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42482* (holotype, fl. NY).

Distribution. Usually a tree up to 10 m, with rather short, densely or loosely flowered, fulvo-sericeous inflorescence, the flowers large, densely pubescent, occurring at about 1100 m along river banks on Cerro de la Neblina and possibly in sabanas of the Siapa River region, Amazonas, Venezuela, at low altitudes. VENEZUELA. Amazonas: from type locality, *Maguire, Wurdack & Maguire 42483* (fr. NY).

Possibly a variety of this species from the same region is the following: *Wurdack & Adderley 43622* (fl. NY), a spindly shrub or tree 2–7 m, occasional in Sabana Hechimoni. This differs from the above in bearing leaves from 7–8 cm on upper branches to 15–18 cm in length, the leaf-bases rounded or obtuse, and somewhat larger flowers, seemingly collected at a more advanced stage of development than those of the type. The floral structure, however, is the same.

Ocotea sericiflora is associated with the *O. aciphylla* complex, the most noticeable differences being in the larger flowers and the usually larger leaves more pronouncedly recurved at their bases.

Ocotea maguireana C. K. Allen, sp. nov. Fig. 46.

Arbor 8 mm, gemmis gracilibus ramulis attenuatis fulvo-pubescentibus substriatis teretibus subferrugineo-pubescentibus, mox glabris rubescentibus. Folia alternata, petiolis gracilibus adpresse pubescentibus, mox crassis glabris atratis, canaliculatis, ad 20 mm longis et 2.5 mm latis, laminis supra glabris subtus sericeo-ferrugineo-pubescentibus, subcoriaceis ellipticis vel ovato-ellipticis, (5–) 12 (–15) cm longis et (2.5–) 6–7 cm latis, ad basim acutis vel subrotundatis, ad apicem graciliter acuminatis, saepe acumine ad 2 cm longo, penninerviis, costa supra impressa subtus satis elevata, nervis ± 4-paribus gracilibus, supra ± inconspicuis subtus leviter elevatis atratis, regulariter ad angulo 35° divergentibus, rete venularum juventute supra minute areolato mox utrinque inconspicuo. Inflorescentia axillaris subterminalisve, satis gracilis subferrugineo-sericeo-pubescens, ad apicem cinerea, multifloro-paniculata, pedunculo 2–3 mm longo. Flores hermaphroditi, ad 5 mm longi, pedicellati; perianthio campanulato eburneo aliquantum carnoso cinereo-pubescenti, lobis ovatis obtusis pubescentibus ad 2 mm longis, tubo ad 1 mm longo; staminibus ad basim pubescentibus, ser I & II ad 1.5 mm longis, filamentis gracilibus, antheras oblongo-ovatas leviter apiculatas aequantibus, ser III antheris quadrangularibus, filamentis biglandulosis, glandulis stipitatis aequantibus, ser IV gracilibus ad 1 mm longis pubescentibus aliquantum graciliter stipitatis cordato-capitatis; ovario ovoideo, glabro, stylo gracili aequanti, stigmate conspicuo triangulari. Fructus ignotus.

Type. Tree 8 m, flowers cream, frequent along banks of Cañon Grande east

of Cumbre Camp, 1100 m, 24 Nov 1957, Cerro de la Neblina, Río Yatua, Amazonas, Venezuela, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42213* (holotype, fl. NY).

Distribution. A tree, unusual for the attractive leaves, bicolored in appearance, forming a contrasting background for the greyish-white, full-flowered inflorescences, occurring, in addition to the type locality, possibly in the Chimantá area of Venezuela. VENEZUELA. Bolívar: east-central portion of Apácaratepuí, *Steyermark 75916* (st. NY).

Except for the color and smaller size of the broader leaves, the general aspect of this species is similar to that of the widespread *Endlicheria bracteolata* (Meissner) Allen and the species of *Ocotea* described below which simulates the latter.

It is a pleasure to name the species for Dr. Bassett Maguire, Coordinator of Tropical Botany at The New York Botanical Garden.

Ocotea esmeraldana Moldenke in Gleason, Bull. Torrey Club **58**: 362. 1931.

Fructus viridis, fide coll., ellipsoideus, apiculatus, 10 × 5–6 mm, cupula rubra, fide coll., cyathiformi, vadosa, patenti, ad 8–9 mm longa et 2 mm alta, ad marginem ad 8 mm diam., stipe ad 2 mm longo, pedicello satis robusto, ad 4 mm longit.

Type. Shrub, Fish Creek, Esmeralda, Amazonas, Venezuela, 350 ft, Apr 1928–Apr 1929, *G. H. H. Tate 963* (holotype ? ♂ fl. NY).

Distribution. Small tree or shrub of extremely variable habit, bearing? hermaphrodite flowers, widespread in the savannas or along streams from the type locality and adjacent regions of the Upper Orinoco, north to Cerro Yapacana and Cerro Moriche, south to Río Pachimoni-Yatua, a tributary of the Río Casiquiare and west across the Río Guainía into Colombia. VENEZUELA. Amazonas: shrub, Grand Savanna, section 1, Esmeralda, 325 ft. *Tate 285* (paratype, fl. NY); frequent on Esmeralda Ridge, *Maguire & Wurdack 34649* (fr. NY); en los sitios sombreados por lajas graniticas en las faldas expuestas atras de Esmeralda, *Williams 15427* (fr. A), *(?) 15327* (fr. F); occasional at streamside, Culebra Creek, Cerro Duida, *Maguire & Maguire, Jr. 29068* (fl. NY); in sabanita at northwest base of mountain, Cerro Moriche, Río Ventuari, *Maguire, Cowan & Wurdack 30929* (fr. NY), *30981* (fl. fr. NY); Río Orinoco, *Maguire, Cowan & Wurdack 30588* (fr. NY); locally frequent in tree "island" in Savanna No. 3, *Maguire, Wurdack & Keith 41542* (fl. NY), occasional at edge of Savanna No. 3, *41499* (fl. NY); frequent in savanna on right bank of Río Pacimoni, 50 km above mouth, *Maguire, Wurdack & Bunting 37559* (fl., fr. NY); en las margenes arboreadas de Yavita, *Williams 14155* (fr. F); frequent along Caño San Miguel just above Limoncito (15 km from Río Guainía) *Wurdack & Adderley 43222* (fl. NY); frequent in sabanita 1 km west of La Ceiba, Caño Miguel 2 km above Limoncito, *Maguire, Wurdack & Keith 41907* (fl. NY); en la sabana de San Antonio, Río Orinoco, *Williams 15071* (fl. F, US); frequent in Sabana El Venado on left bank of Caño Pimichín above Pimichín, *Maguire, Wurdack & Bunting 36357* (fl., fr. NY); occasional in same locality, *Maguire & Wurdack 35584* (fl. NY), in sabanita 1 km east of Maroa, *35682* (fl. NY); frequent in scrub savanna 7 km north of Maroa, *Maguire, Wurdack & Keith 41747* (fl. NY). COLOMBIA. Comisaría del Vaupés: occasional in sabanita 0.5–1.5 km north of Puerto Colombia (opposite Maroa), Río Guainía, *Maguire, Wurdack & Keith 41853* (fl. NY); frequent in Cacagual savanna, Río Atabapo, *Maguire, Wurdack & Keith 41452* (fl. NY).

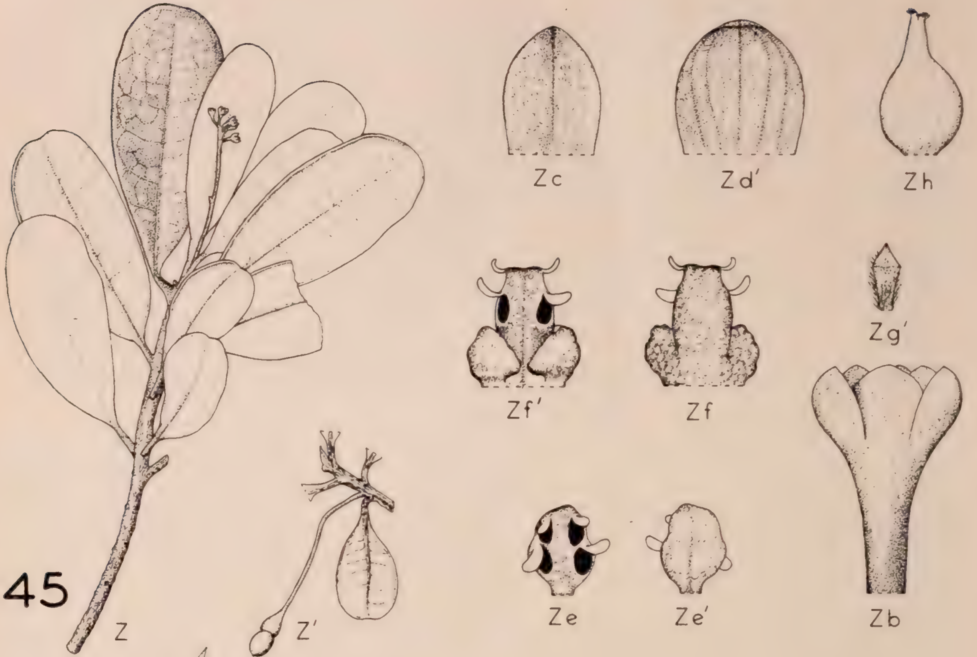
The great variation possible in a single taxon growing in savanna is extremely well exemplified by the above species. According to the collectors of The New York Botanical Garden, Maguire and Wurdack, various areas in and bordering the savannas give rise to characteristics that, without a series of plants from these differing areas for comparison, might easily lead the herbarium botanist to believe that several taxa were involved. The difference in size, texture, and reticulation of the leaves is not accompanied by correspondingly striking differences in fruit or flower structures. In general, the leaves are smaller and more coriaceous on plants in the open savanna than those of plants in more protected areas or along the shaded rivers. Minor differences in length of style, shape of ovary, and presence or absence of staminodia have been noted, but none are consistent for the varying habitats and so do not warrant, on the basis of present material, the erection of a series of varieties typifying them. Mature fruits of the species have not hitherto been noted.

The original description of *O. esmeraldana* states that pistillate flowers were not seen. The species seemingly is hermaphrodite. Very probably *O. ceanothifolia* (Nees) Mez belongs here with this complex, reported as hermaphrodite, based on Martius' specimen from Brazil, "Alto Amazonae in silvis ad flumen Japura pr. Porto des Miranhos et prov. Pará in silvis ad flumen Amazonas." Only a photograph of the type from Japura is at hand, hence attention is merely drawn to the possibility that these taxa may be conspecific with the numbers cited from Venezuela and Colombia. Examination of Martius' type materials may entail a re-evaluation of the current collections and a subsequent change of nomenclature.

Ocotea wurdackiana C. K. Allen, sp. nov. Fig. 45.

Arbor ad 4 m alta, gemmis attenuato-acutis griseo-sericeis, ramulis robustis cicatricosis griseis ad apicem folia dense aggregata ferentibus, juventute minute griseo-pubescentibus mox glabris. Folia spiralia, chartaceo-coriacea, petiolis satis robustis ad 10 mm longis atratis, laminis nitidis, utrinque glabris, juventute subsericeis, supra atro-virentibus subtus argenteis, obovatis, (2.5–) 5.5–8 cm longis et (1.5–) 2.5–3 cm latis, revolutis, penninerviis, costa nervisque supra pallide viridibus, costa subtus pallide lutea, supra ± plana subtus prominenter conspicueque elevata, nerviis 6–12-paribus, ad angulo fere 90° divergentibus ad marginem supra conspicue prominenterque elevatis, subtus obscuris, rete venularum supra laxe prominenterque elevato subtus obscuro. Inflorescentia axillaris, floribus ad apicem rhachidis laxe congestis, brevis, ad 4 cm longa, pauciflora, a foliis ± obscurata. Flores hermaphroditi, ad 5 mm longi, pedicellati, pallide virides fide coll., perianthio campanulato, gracili, lobis ovatis obtusis, ad 1.5 mm longis, marginibus albidis, tubo ad 1 mm longo; staminibus ser I & II ad 1.2 mm longis, antheris ovato-truncatis quam filamentis brevibus duplo longioribus, ser III subrectangularibus biglandulosis, glandulis quam filamentis magnis longioribus, ser IV ad 0.7 mm longis cordato-ovatis quam stipitibus gracilibus pubescentibus longioribus; gynoecio glabro ad 2 mm longo, ovario ellipsoideo in stylum subaequalem attenuato; stigmate subtriangulari plus minusve inconspicuo. Infructescentia aliquantum incrassata ad 6 cm longa. Fructus viridis, oblongus, nitidus, apiculatus, ad 7 × 5 mm, cupula rugosa, vadissima, late obconico pedicello mergenta, ±6 mm longo ad marginem 5 mm diam.

Type. Tree 2.5–4 m, leaves chartaceous, revolute, erect, closely crowded, deep green above with pale green nerves, silvery below with prominent pale yellow midrib, peduncle pale green, erect, flowers pale green, the perianth with whitish


Zc
Zd′
Zh
Zf′
Zf
Zg′
Ze
Ze′
Zb
45
Z
Z′

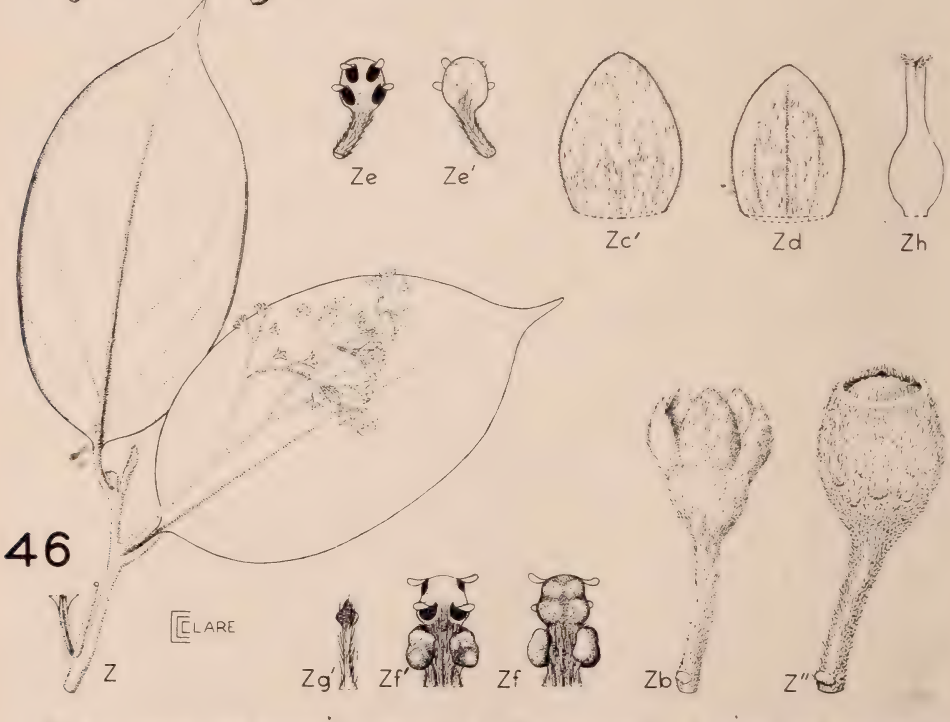

Ze
Ze′
Zc′
Zd
Zh
46
Z
CLARE
Zg′
Zf′
Zf
Zb
Z″

FIG. 45. *Ocotea wurdackiana* (*Steyermark & Wurdack 1041*). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc, tepal, ser I, ventral, × 10. Zd′, tepal, ser II, dorsal, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze′, stamen, I & II, dorsal, × 10. Zf, stamen, ser III, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zg′, staminodium, dorsal, × 10. Zh, ovary, × 10. Z′, fruiting branchlet, × 0.5. FIG. 46. *Ocotea maguireana*, (*Maguire, Wurdack & Maguire 42213*). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc′, tepal, ser I, dorsal, × 10. Zd, tepal,

margins, cupule reddish, fruit green, nitid, oblong, open dwarf forest, north-facing slopes on summit above valley of Caño Mojado, Chimantá Massif, Torono-tepuí, Bolívar, Venezuela, 2030–2150 m, 21 Feb 1955, *Julian A. Steyermark & John J. Wurdack 1041* (holotype, fl., fr. NY).

Distribution. Small tree known from type locality, Torono-tepuí, Chimantá, Bolívar, Venezuela, along Caño banks or in open dwarf forest from 1895 to 2500 m and from the Cumbre of the Caroní region. VENEZUELA. Bolívar: along banks of Caño Mojado, east of north escarpment, below upper falls of Caño Mojado, *Steyermark & Wurdack 960* (fl. buds, NY); Cumbre del Cerro Acopán, Caroní, *Cardona 2270* (fl. US); summit of Carrao-tepuí, *Steyermark 60897* (fl. F).

The leaves densely clustered at the branchlet-tips, their shape, their prominent venation, the lateral nerves arising at virtually right angles to the midrib and continuing straight to the margin, make this species unique in the genus. The nearest affinity seems to be with the group to which *O. esmeraldana* belongs. It is separated from this exceedingly variable taxon by the leaf characteristics just mentioned, as well as by having an inflorescence shorter than and obscured by the leaf-clusters.

The species is named for Dr. John J. Wurdack, collector and student of tropical flora, who has been generous with his assistance to all who have labored in this area.

Ocotea roraimae Mez, Repert. Sp. Nov. **16**: 307. 1920.

Type. Baum im unteren Walde, Roraima, 1900 m, Jan 1910, *E. Ule 8606* (isotype, fl., fragm. & photo. F, photo. NY).

Vernacular Name. Cavi si-yek (Bernardi).

Distribution. Tree with hermaphrodite flowers known from the slopes of Mount Roraima, British Guiana, and from neighboring mountains in the sandstone area of Amazonas, Venezuela, up to 2200 m. VENEZUELA. Bolívar: vicinity of Bluff Camp, at base of west-facing sandstone bluffs at Chimantá-tepuí (Torono-tepuí), 1700 m, *Steyermark 75614* (fr. NY), *75607* (fr. NY); bosques de montana del Aprada Tepuý, Urimán, *Bernardi 978* (fl. NY), orillas del Río Icabarú, cerca del campo diamantifero de Uaiparú, *6583* (y. fr. NY), *6631* (fl. NY). Amazonas: occasional in scrub forest 4 km north of Cumbre Camp, summit of Cerro de la Neblina, Río Yatua, *Maguire, Wurdack & Bunting 37173* (fl. NY), *37184* (fl. NY); infrequent in upper basin of Cañon Grande above Salto Grande, *Maguire, Wurdack & Maguire 42361* (fl. NY).

The Bernardi numbers show leaves less pubescent and larger than those described by Mez from Ule's collection, but are otherwise similar. *Steyermark 75607*, if correctly placed, bears leaves less acuminate than those of the type, but even more densely pubescent on the lower surface and young branchlets. The detached fruit, however, although in a younger stage of development, is characteristic of the species.

The fruiting specimen of *Holt & Blake 705*, collected at Cerro Yapacana in the upper Río Negro region of Amazonas, Venezuela, was compared by A. C. Smith at Kew with the flowering type. The oblong-ellipsoid fruit is over 2 cm

---

ser II, ventral, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze′, stamen, ser I & II, dorsal, × 10. Zf, stamen, ser III, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zg′, staminodium, ser IV, dorsal, × 10. Zh, ovary, × 10. Z″, fruit (very young), × 0.5.

long and approximately 1.3 cm in diameter, seated in a shallow, cyathiform cupule not more than 5 mm deep, 13 mm long including the short, constricted, stipelike base, and 13 mm broad. *Pinkus 145* from the type locality, Roraima, shows a cupule more constricted, more typically cyathiform than that of the Holt & Blake number, with which former specimen *Steyermark 75614*, from Chimantá, agrees perfectly.

All the specimens, including the fragment of the type of which a leaf only is available, show in varying degrees the black mycelium of a fungus which seemingly is residual and indeed may be specific for the taxon.

Ocotea bofo H. B. K. Nov. Gen. & Sp. **2**: 128. 1817; Mez, Jahrb. Bot. Gart. Berlin **5**: 357. 1889.

Type. In sylvis calidis, Colombia, *Humboldt & Bonpland 3646* [holotype, ? fl., (s.n.) photo, GH, fragm. leaf, F].

Vernacular Name. Laurel (Williams).

Distribution. A tree with dioecious flowers found throughout the basin of the Río Orinoco and its tributaries from 90 to 115 m, in Bolívar and Amazonas, Venezuela, in addition to the type locality. VENEZUELA. Bolívar: El Tigre, cerca del Río Cuchivero, *Williams 13303* (fr. F, US), en selva baja, periódicamente anegada de El Tigre, *13319* (fr. F); savanna margins 1–3 km east of Río Orinoco between mouth of Río Horeda and Cerro Gavilan (Cerro Carichana), *Wurdack & Monachino 39919* (♂ fl. NY); frequent on river flood plain at base of Piedra Marimare, east bank of Río Orinoco, opposite head of Isla el Gallo, *39983* (♂ fl. NY), locally frequent along Río Parguaza just below Raudal Maraca (about 110 river km from mouth), *40993* (♂ fl. NY), occasional along Río Suapure, between Raudal Budare and Raudal Punta Brava (70–80 river km from mouth), *41264* (♂ fl. NY). Amazonas: in open, Puerto Ayacucho, *Holt & Gehriger 404* (fr. NY), *405* (fr. NY).

I have not seen the type, only a leaf-fragment; this agrees with the interpretation of Dr. A. C. Smith who, in 1932, compared the last two numbers with the type material at Paris, the fruit of which was then not known. All the above collections are conspecific with Smith's interpretation. It is interesting to note that the nearest relative is seemingly *Ocotea rubrinervis*, described from Tarapoto, Peru, whose fruit, according to Mez (p. 352), is like that typical of the genus *Phoebe*. There is no question, however, after consideration of the floral structure, that the species here treated is an *Ocotea*.

Ocotea glandulosa Lasser, Bol. Téc. Caracas **3**: 9. *pl. 3*. 1942.

Type. Small or medium-sized tree with spreading or umbrella-shaped crown, trunk round, straight, flowers creamy yellow, small, in dense trophilous forest on slopes, Parque Nacional Aragua, Venezuela, 540 m, *Llewelyn Williams 10270* (holotype, fl. F).

Distribution. Small or medium-sized tree with hermaphrodite flowers, seemingly abundant in the region about the type locality and in the Chimantá area of Bolívar, Venezuela. VENEZUELA. Bolívar: by Quebrada, half-way up southwestern-facing slopes of Chimantá-tepuí (Torono-tepuí), above valley of Río Tirica, 1000–1700 m, *Steyermark 75424* (y. fr. NY).

Although the Steyermark material shows larger leaves, the fruit is typically that of *O. glandulosa*. Flowering specimens from Chimantá may show that this is indeed a separate though related taxon.

The species appears to be associated with the "glomerata" complex, but is easily distinguished from the latter by the presence of hermaphrodite flowers, by the more loosely reticulate leaves, by the more dense and more persistent ferruginous-tomentose pubescence of the young branchlets, and particularly by the fruits which in *O. glandulosa* are ellipsoid, almost wholly exserted, seated in a shallow, subpateriform-campanulate, verruculose cupule subtended by a thickened pedicel. The fruit of *O. glomerata,* on the other hand, is oblong or ellipsoid, not more than 10 mm long and (4–) 5 mm broad, and snugly enclosed one-third to one-half their length in a suburceolate, cyathiform, short-stipitate cupule subtended by a comparatively slender pedicel.

Ocotea guianensis Aublet, Pl. Guiane **2**: 781. 1775. Mez, Jahrb. Bot. Gart. Berlin **5**: 296. 1889.

Ocotea guyanensis Aublet, Pl. Guiane **4**: *pl. 310.* 1775.

Type. French Guiana, *Aublet* (possible isotype ? fr. GH).

Distribution. Spectacular tree of varying height with dioecious flowers, originally described from French Guiana, occurring generally throughout the Amazon Basin as far west as Colombia. VENEZUELA. Bolívar: common understory tree, forested area on top of ridge in vicinity of km 134 bordering headwaters of Río Cuyuní, NE of Luepa, *Steyermark & Nilsson 510* (st. NY); in rainforest between Camp 2 and Camp 3, slope forest, Tirepón-tepuí, *Wurdack 34052* (♂ fl. NY); southwestern-facing forested slopes of Chimantá-tepuí (Torono-tepuí), between Base Camp and steep slopes above valley of Río Tirica, *Steyermark 75417* (fr. NY); selva pluvial, Zona: campo diamantifero Uaiparú, region de los Ríos Icabarú, Hacha, y cordillera sin nombre a 280° de la cabeceras del Río Hacha, *Bernardi 2742* (fr. NY), *2801* (♂ fl. NY); cerca de la boca del Icabarú, Río Caroní, *Cardona 1676* (st. NY); en la margen de la selva de tierra firme, Victorino, Río Guainía, *Williams 14817* (♂ fl. F); along Río Guainía, just below Banderita, *Wurdack & Adderley 44193* (♂ fl. NY). COLOMBIA. Intendencia del Meta: Sierra de la Macarena, scrub forest on summit of Approach Ridge, Central Mountains, *Philipson & Idrobo 1882* (fr. BM, NY).

Meissner recognized three varieties of this widespread species, *argentea, sericea, aurea,* but I agree with Mez that these should be considered as one species for the distinction in each variety is a minor one. The strict, ascending habit of the leaves, with brightly colored, sericeous under surfaces, sets the species apart without question. Except for these last-mentioned striking leaf-characteristics, *O. guianensis* is similar to *O. glomerata* with which complex it is probably most closely associated.

Ocotea glomerata (Nees) Mez, Jahrb. Bot. Gart. Berlin **5**: 294. 1889.

Oreodaphne glomerata Nees, Linnaea **21**: 515. 1848.

Vernacular Names. Laurel (Steyermark, Williams); Louro (Cowan & Maguire).

Type. Savanna bei Pirara im Brittischen Guiana, Julio ♀, *Rich. Schomburgk 675* (isotype, ♀ fl., fragm. NY).

Distribution. Large tree with dioecious (polygamo-dioecious?) flowers in glomerules, growing generally throughout the coastal area from Brazil and the Guianas to Trinidad and Venezuela. VENEZUELA. Bolívar: en la margen de selva baja, La Paragua, *Williams 12812* (fr. F); rolling forest between km 38 and 42, S of El Dorado, *Steyermark 86654* (⚦ fl. NY), woods bordering savanna by Río Asa, above Raudal Cotua, S of La Paragua, *86761* (⚦ fl. NY), woods in vicinity of ''Los Patos,'' 2 km SE of Los Patos, N of Río Hacha about 15 km N of Río Supamo, 30 km S of El Manteco, *86951* (⚦ fl. NY). BRAZIL. Amazonas: occasional in woodland near Fazenda Natal, 10–12 km northeast of Fazenda Vista Geral, *Maguire & Maguire 40256* (fr. NY); Amapá: occasional in rainforest on Fritz Akerman Ore Body, Río Amapári, Serro de Navio, *Cowan & Maguire 38114* (♀ fl. NY).

The identifying features of this species are the lanceolate-elliptic leaves, finely reticulate above, usually equally attenuate at base and apex, and the densely glomerulate pubescent inflorescences expanding to 25 or more cm in the fruiting stage and becoming glabrescent.

The Steyermark numbers bear flowers that are seemingly hermaphrodite. Since in all other respects these sheets resemble the widely distributed *O. glomerata,* one must conclude that, in some areas at least, the species may be polygamo-dioecious. Fruiting collections are not known from this region. Subsequent collections may reveal that another taxon is involved.

Ocotea tomentella Sandwith, Kew Bull. **1935**: 130. 1935.

Type. Tree 120 ft high, 37 inches diam., small buttresses extending 15 ft up trunk, flowers white, pedicels and peduncles very pale green, with brown-scurfy tomentum, leaves dark green above, pale below, in mixed forest, Arawak Matope, Cuyuní River, about 300 ft, 17 Jul 1938, *T. G. Tutin 375* (isotope ♂ fl., US).

Vernacular Name. Baradan (Tutin, Maguire & Cowan, For. Dept. Brit. Guiana).

Distribution. Tall tree with dioecious flowers, known only from the type locality and along neighboring rivers of British Guiana. BRITISH GUIANA. Mazaruni Station, *For. Dept. F 631* (*3367*) (♀ fl. NY); Northwest Territory: clearing for washing plant, Matthews Ridge, Barima River, *Maguire & Cowan 39320* (♀ fl. NY).

The densely foliaged tree with long, stiff, sturdy inflorescences is characterized by leaves with blades decurrent for up to 2.5 cm on the robust petioles. There may be a possible relationship with *Ocotea caracasana* (Nees) Mez, which also has dioecious flowers, based on *Karsten 32,* which type I have not seen, nor material compared with it. From the description given by Mez, the following differences emerge: *Ocotea caracasana* is a tree or shrub with ferruginous-tomentellous inflorescences, branchlets, and young leaves, the mature leaves 13 cm long and 6 cm wide, borne on petioles up to 10 mm in length, slightly canaliculate. *Ocotea tomentella* is a tall tree, reported to be 125 ft high, with brown-tomentellous inflorescences and branchlets, the leaves up to 25 cm long and 9.5 cm wide, borne on petioles up to 20 cm in length and deeply canaliculate. The fruit of *O. caracasana* to my knowledge has not been collected. The fruiting material cited by Sandwith, *Lockie 2035* from Camaria, is described by him as being ellipsoid, up to 2 cm long and 1.2 cm broad, seated in a hemispheric cupule 8–10 mm deep, commonly 1.2–1.3 cm in diameter, with simple, entire margin, densely rugulose, glabrescent without, attenuated at its base into a thickened pedicel 4–5 mm long.

Ocotea opifera Martius in Buchner, Repert. **1830** (35): 179. 1830. Mez, Jahrb. Bot. Gart. Berlin **5**: 291. 1889.

Type. "Alto Amazonas et Pará in sylvis secus flumina Rio Negro et Amazonas, *Martius s. n.*" (syntypes?, fl. fr. M).

Distribution. Large-leaved shrub or tree, with dioecious flowers growing in Brazil and Venezuela, along the Amazon, Rio Negro, and Rio Madeira and their tributaries, at comparatively low altitudes. VENEZUELA. Amazonas: occasional along Río Siapa between Raudal Gallineta and Salto Gallineta (about 110–130 river km from mouth), *Wurdack & Adderley 43581* (♀ fl. NY). BRAZIL. Amazonas: terra firme, Tabatinga, *Murça Pires & Black 966* (♂ fl. GH), Parintins, *1148* (♂ fl. GH).

Since the original publication is not available, nor either of the syntypes, I have had necessarily to depend on Mez' description and his cited *Riedel 1303* (fl. NY), for a concept of the species.

The following numbers bear a resemblance to the species, though they do not entirely agree in every respect: *Steyermark & Wurdack 1249* (y. fr. NY), from Chimantá Massif, and *Wurdack & Guppy 69* (♂ fl. NY) from Hato La Vergareña. Possibly there may be a relationship with *Ocotea hemsleyana* Mez, based on *Jenman 878, 897,* from "Kaiteur Savannah" British Guiana, neither of which have I seen.

Ocotea cuprea (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 299. 1889.

Oreodaphne cuprea Meissner in DC. Prodr. **15**^{1}: 114. 1864.

Type. Prope Tarapoto, Peruviae orientalis, 1855–6, *Spruce 4844* (isotype, ♀ fl. NY).

Vernacular Name. Laurel (Williams).

Distribution. Tree with subdioecious flowers (according to Mez), to 20 m, from Eastern Peru, Amazonas, Venezuela, and Vaupés, Colombia, at an altitude of 100–200 m. VENEZUELA. Amazonas: en la selva alta, tupida de tierra firme, San Carlos de Río Negro, *Williams 14594* (fr. A). COLOMBIA. Comisaría del Vaupés: riberas del Río Inírida (longit. 70°30′ W), alrededores del sitio llamado "Morichal" cerca de la boca del Río Papunáua, *Fernandez 2320* (fr. US).

This species, based on ♂ flowering material alone, is similar in habit to *O. oblonga* (Meissner) Mez from French Guiana and Trinidad, based on ♀ and fruiting specimens (isotype, *Sagot 491,* ♀ fl. NY). There appears to be a close relationship between the two, if indeed they are not conspecific. Again, more material is essential before this can be determined with certainty.

Ocotea neblinae C. K. Allen, sp. nov. Fig. 51.

Arbor ad 10 m alt., gemmis ut videtur gracilibus parvis lanceolato-ovoideis griseo-pubescentibus, ramulis robustis conspicue striatis rubris mox griseis glabris. Folia alternata, petiolis crassis ad 10 mm longis breviter canaliculatis, laminis utrinque glabris, coriaceis obovatis, (6–) 9–13 cm longis et (2.5–) 4.5–6 cm latis ad basim cuneatis leviter decurrentibus, ad apicem rotundatis vel minute emarginatis, margine recurvatis, penninerviis, costa utrinque elevata, ad basim conspicue lata, nervis 6–8-paribus supra obscure subtus graciliter conspicueque elevatis, ad angulo 35–55° divergentibus. Inflorescentia axillaris, multiflora, glabra, rubescens, patenti-paniculata, ad 20 cm longa quam foliis longior, pedunculo ad 10 cm longo. Flores dioici, ♂ ad 4 mm longi, perianthio campanulato

gracili, lobis oblongo-ovatis, ad 2 mm longis, ± tubo duplo longioribus; staminibus 1–1.2 mm longis membranaceis ser I & II antheris ovatis quam filamentis quadruplo longioribus, ser III antheris rectangularibus biglandulosis, glandulis permagnis subsessilibus, ser IV O; gynoecio O; flores ♀ ad 4 mm longi (post anthesin), perianthio campanulato, lobis ovatis 1.5 mm longis, reflexis intus ad apicem papillosis, tubo lobos subaequanti; staminibus sterilibus utrinque locellis obliteratis, ser I & II ad 0.5 mm longis, antheris ovatis quam stipite satis robusto triplo longioribus, ser III ad 0.5 mm longis, glandulis quam antheris obovatis et filamentis robustis longioribus, ser IV O; gynoecio 1–1.2 mm longo glabro, ovario ellipsoideo, stigmate magna subtriangulari fere subsessili.

Type. Small tree, flowers white, occasional in *Clusia* scrub forest just south of Camp 3, Cerro de la Neblina, Amazonas, Venezuela, 700 m, 14–16 Nov 1957, *Bassett Maguire, John J. Wurdack & Celia K. Maguire 42059* (holotype, ♂ fl. NY).

Distribution. Known from the type locality and possibly from Cerro Yapacana, Río Orinoco, Amazonas, Venezuela, and the Brazilian Amazon Basin. VENEZUELA. Amazonas: occasional in Savanna No. 3, at northwest base of Cerro Yapacana, Río Orinoco, *Bassett Maguire, John J. Wurdack & George S. Bunting 36585* (♀ fl. NY). BRAZIL. Amazonas: Manáos, Estrada do Aleixo, silva secus rivulum loco paludoso, *Ducke 1737* (♂ fl. NY).

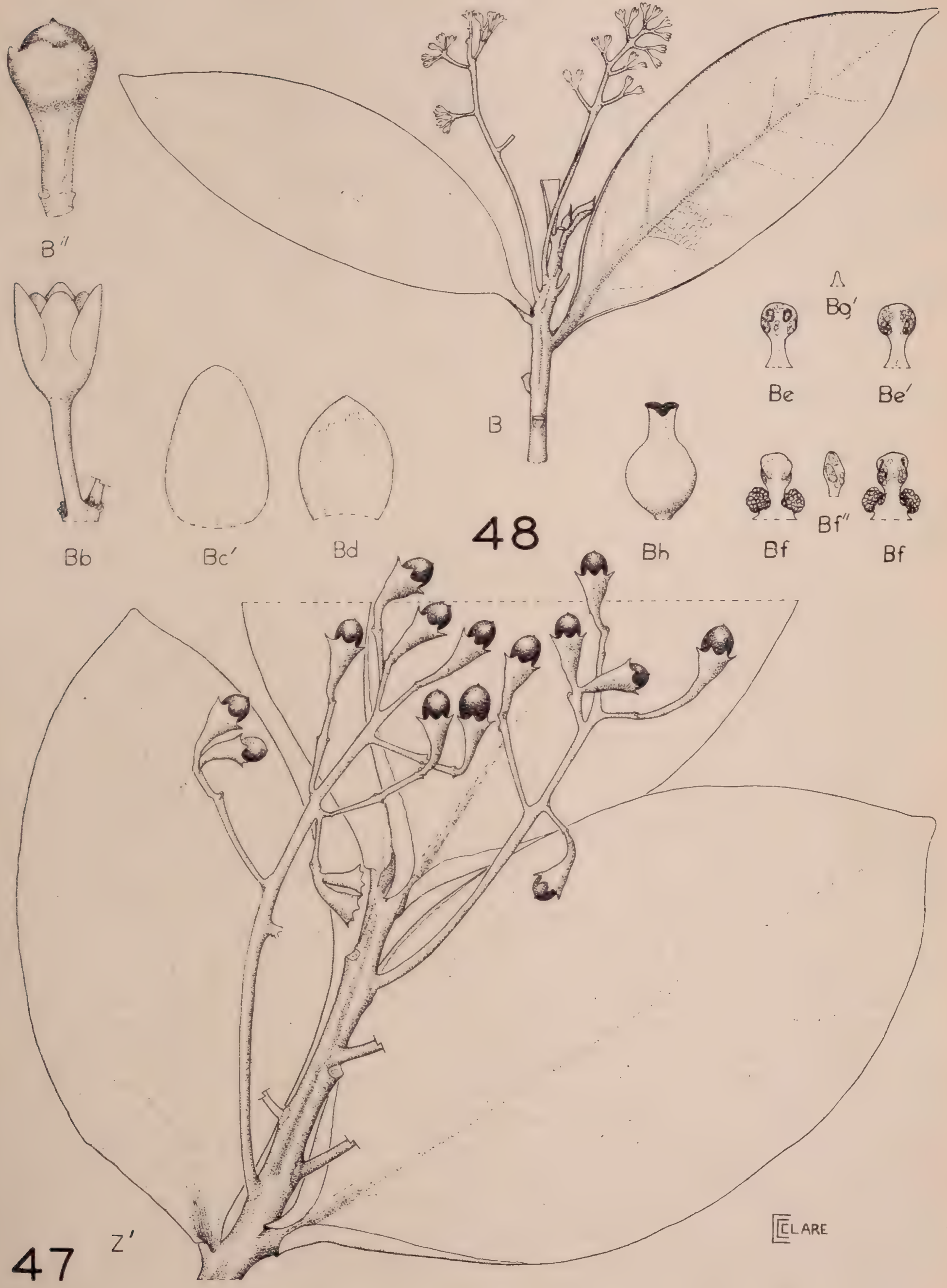
The Ducke specimen agrees entirely with the type; the Yapacana material differs in having elliptic leaves up to 15 cm long, with an obtusely acute or abruptly obtusely acuminate apex. This number bears pistillate flowers similar in structure to the staminate, except for the larger gynoecium. A single young fruit borne on a slightly thickened rachis appears almost completely enclosed in the cyathiform cupule which equals the thickened stipe. There is a difference in the leaves of the pistillate specimen (*36585*) which more ample material may lessen by presenting intermediate forms. On the contrary, the converse may be true and two taxa presently found to exist.

Ocotea basirecurva C. K. Allen, sp. nov. Fig. 47.

Arbor ad 10 m alt., gemmis robustis (in ramulis fructiferis) ovoideis attenuate acutis atro-rubris glabris, ramulis robustis angulatis rubris glabris ad apicem nitidis. Folia alternata, petiolis robustissimis atro-rubris brevibus ad 2 mm longis et ad 6 mm latis ad basim intumescentibus, laminis utrinque glabris, percoriaceis obovatis vel late ellipticis, (13–) 15–20 cm longis et (7.5–) 8.5–11 cm latis, ad basim decurrentibus auriculato-recurvatis, ad apicem obtuse acutis rotundatis penninerviis, costa utrinque robusta supra leviter subtus prominenter elevata ad basim conspicue lata, ad 5 mm, nervis 8–10-paribus utrinque prominentibus, ad angulo 45° divergentibus. Inflorescentia floresque ignoti. Infructescentia robusta, ad 20 cm longa, multifructifera, glabra, pedunculo ad 7 cm longo. Fructus immaturus viridis, ? obovoideus, apiculatus, ad 10 × 6–7 mm, cupula vadosa, campanulata, 6-dentata, ad 8 mm longa, ±10 mm diam., et ±1–3 mm alta, pedicello incrassato obconico aequanti subtenta.

Type. Tree 10 m, with leathery leaves, fruit wholly green, occasional in right branch of Caño Yutaje, Cerro Yutaje, Serranía Yutaje, Río Manapiare, Amazonas, Venezuela, 1300 m, 9 Feb 1953, *Bassett Maguire & Celia K. Maguire 35096* (holotype, fl. NY).

This distinctive tree with large auriculate leaves does not resemble any recognized species at hand in the flowering stage. Just possibly this may be later



48

47

Fig. 47. *Ocotea basirecurva* (*Maguire & Maguire 35096*). Z′, habit, fruiting branchlet, × 0.5. Fig. 48. *Ocotea cowaniana* (B–Bh, *Cowan & Wurdack 31303* ♀; B″, *31106*). B, habit, ♀ flowering branchlet, × 0.5. Bb, flower, × 5. Bc′, tepal, ser I, dorsal, × 10. Bd, tepal, ser II, ventral, × 10. Be, sterile stamen, ser I & II, ventral, × 10. Be′, sterile stamen, ser I & II, dorsal, × 10. Bf, stamen, ser III, ventral, × 10. Bf′, stamen, ser III, dorsal, × 10. Bg′, staminodium, ser IV, dorsal, × 10. Bh, ovary, × 10. B″, fruit (young), × 0.5.

assigned to another genus. Further collections may throw light on its relationship and correct placement.

Ocotea crassifolia (Nees) Mez, Jahrb. Bot. Gart. Berlin **5**: 336. 1889.

Oreodaphne crassifolia Nees, Linnaea **21**: 520. 1848.

Type. Im Brittischen Guiana bei Roraima, *Rich. Schomburgk 934* (isotype, ♂ fl., photo & leaf fragm. F).

Distribution. A small tree with dioecious flowers on slopes of Mount Roraima and neighboring Sarvén-tepuí, Bolívar, Venezuela, 1400 m alt. VENEZUELA. Bolívar: along Río Sarvén between Camps 3 and 4, *Wurdack 34076* (♂ fl. NY).

A species striking because of the large, leathery, densely reticulate leaves borne on stout, dark, reddish-brown petioles which contrast with the mature branchlets early changing from dark red to grey. Here may belong the *Tate 246* (st. NY) collected in 1928. In habit the branchlets appear to simulate those of *Ocotea sprucei* (Meissner) Mez, which, however, bear smaller, more orbicular leaves without prominent reticulation.

Ocotea lasseriana C. K. Allen, sp. nov. Fig. 40.

Arbor parva vel arbustum, gemmis ellipsoideis acuminatis dense ferrugineo-tomentellis, ramulis atratis ± crassis conspicue angulatis ferrugineo-tomentellis, mox glabrescentibus. Folia alternata, petiolis satis crassis pubescentibus manifeste canaliculatis ad 15 mm longis et 2–3 mm latis, laminis supra glabris (costa excepta) ad basim glabrescentibus, subtus minute ferrugineo-tomentellis praecipue costa venisque, mox glabrescentibus, coriaceis ellipticis vel ovato-ellipticis, (8–10–) 15–20 cm longis et (2.5–) 4–5 cm latis, ad basim ± rotundatis, ad apicem longe attenuateque acuminatis, acumine ad 2.5 mm longo, margine ad basim leviter recurvatis, penninerviis, costa supra leviter impressa, subtus prominenter elevata, nervis (5–) 8–10-paribus supra inconspicue leviterque impressis, subtus utrinque elevatis, ad angulo 45° divergentibus, rete venularum inconspicuo. Inflorescentia axillaris subterminalisque, multiflora, aliquantum crassa, minute ferrugineo-tomentella, ± gracilis pyramidato-paniculata, ad 14 cm longa, pedunculo rachideque crassis conspicue angulatis. Flores dioici, eburnei vel viridi-flavescentes fide coll., ♂ ad 4 longi, pedicello ad 2 mm longo; perianthio campanulato gracili, lobis ovatis ad 1.7 mm longis, tubo ad 0.5 mm longo; staminibus ser I & II ad 1 mm longis antheris ± ovatis quam filamentis brevibus triplo longioribus, ser III antheris subrectangularibus quam filamentis duplo longioribus, biglandulosis, glandulis subcordatis, stipitatis, ser IV 0; gynoecio abortivo gracili; flores ♀, ♂ simili, staminibus ser I, II, & III immaturis, ser IV 0; gynoecio glabro ad 1 mm longo ovario conspicue subtriangulari. Infructescentia incrassata, ad 15 cm longa. Fructus maturus? atratus, ellipsoideus, apiculatus, 10 × 8 mm, cupula tenui cyathiformi, margine ± plana ad 6 mm longa, 5 mm diam. et 3 mm alta, rubra fide coll., pedicello brevi satis incrassato subtenta.

Type. Arbol de mediano tamaño, flores crema, selva de Oparumá Kavanayén, Bolívar, Venezuela, 30 May 1946, *T. Lasser 1868* (holotype, ♂ fl. F., isotype, US).

Vernacular Names. Muneu-yek, Manau-yek (Steyermark).

Distribution. Shrub or small tree with unusual 4–5-angled branchlets, the full-flowered inflorescence, axillary and subterminal, known only from the sandstone region in Bolívar, Venezuela, from 900 to 1300 m, with one collection reported from Colombia. VENEZUELA. Bolívar: dense forest at base of Cerro Ptari-tepuí, along Río Karuai, *Steyermark 60642* (fr. NY); wooded margin below edge of mesa escarpment between Santa Teresita de Kavanayén and wooded quebrada about 8 km northwest of Kavanayén, *Steyermark 60455* (fr. F); en selvas, Kavanayén, *Lasser 1732* (♂ fl. F, US), selva de Oparumá, *1880* (♂ fl. F), Quebrada de Pakairao, *1930,* (♂ fl. F, US), en selvas alrededores de Santa Elena de Uairen, Alto Caroní, *1636* (♀ fl. F, US); Gran Sabana, Cerro Akurimá, Santa Elena, *Tamayo 3251* (♀ fl. F, US); orilla de selva pluvial, Cercanias al Este de Santa Elena, *Bernardi 6718* (fr. NY).

The species is closely related to *Ocotea acutangula* (Miquel) Mez, described from Bahia. Miquel's original publication gives as type *Blanchet 2961.* This is obviously an error, for both the isotypes available bear the number 3961, as cited by Mez.

The species is separated from Miquel's by ferruginous pubescence which tends to be more persistent; the leaves are in general longer and more narrowly ovate-elliptic; and the inflorescences attain a greater length and many are more perfectly pyramidal. The immature fruiting material from the Steyermark collections (a taller tree than the other specimens cited), representing a young flowering stage, compares favorably with the mature fruit from the Bernardi collection. The leaves of the pistillate specimen are rather more elliptic than ovate-elliptic and on the whole less long-acuminate. In other respects, however, the characters are in agreement.

It is with pleasure that I name this species for Dr. Tobias Lasser, Director, Instituto Botánico, Caracas, Venezuela, whose interest in the Lauraceae has long been known.

Ocotea atrata C. K. Allen, sp. nov. Fig. 44.

Arbor parva vel frutex ad 2 m, gemmis ovoideis acute attenuatis, minute adpresseque fulvo-sericeis, ramulis atro-rubris conspicue sulcatis et abrupte flexuosis juventute minute fulvo-pubescentibus mox atro-pubescentibus glabrescentibus. Folia alternata, petiolis robustis obscure pubescentibus atro-rubris breviter canaliculatis, ad 12 mm longis et ad 3 mm latis, laminis maturis utrinque glabris, costa subtus excepta, coriaceis supra ± nitidis subtus subnitidis vel pallidioribus opacis, juventute oblongis, maturitate ellipticis ovatisve variabilibus, 9–15 cm longis et 3.5–8 cm latis, ad basim obtusis rotundatisque et saepe valde revolutis, ad apicem rotundatis acutis vel abrupte acuminatis apiculatisque, penninerviis, costa et nervis utrinque ± conspicuis ochraceis, costa supra leviter immersa, subtus conspicue elevata, nervis (3–) 5–7-paribus, ochraceis gracilibus supra planis subtus conspicuis elevatisque, ad angulo 55–45° divergentibus, rete venularum laxa supra aliquando conspicua subtus conspicue elevata. Inflorescentia axillaris subterminalisque, satis robusta, utrinque dense minuteque subferrugineo-pubescens, aliquantum stricte racemoso-paniculata, ad 10 (–12) cm longa brevipedunculata. Flores dioici ? ♂ ad 3 mm longi minute pubescentes, pedicello ad 2.7 mm longo, perianthio ± campanulato, eburneo- vel flavo-viridescenti fide coll., lobis satis crassis ovatis extus papillosis, ad 2 mm longis, tubo quam lobis breviore; staminibus ser I & II ad 0.8 mm longis, antheris ovatis ± truncatis quam filamentis triplo longioribus, ser III ad 1 mm longis antheris subquadrangularibus filamentis aequantibus biglandulosis, glandulis stipitatis basilaribus, ser IV O, vel minutis abortivisque; gynoecio abortivo ad 1.6 mm longo, stigmate magno peltato; flores ♀ (post anthesin) ad 4 mm longi, perianthio pubescenti, lobis ad 1.8 mm longis utrinque reflexis, exterioribus anguste ovatis, interioribus spathulatis, tubo ad 1 mm longo, pedicello ±1 mm longo; staminibus sterilibus ser I & II ad 0.7 mm longis antheris filamenta robusta aequantibus, ser III ovatis truncatis, ad 0.8 mm longis, antheris quam filamentis duplo longioribus biglandulosis, ser IV O; gynoecio ad 1.6 mm longis glabris, ovario obovoideo quam stylo robusto longiori stigmate conspicue patenti. Infructescentia et fructus ignoti.

Type. Small tree, flowers yellowish, left fork east drainage of central drainage canyon near east escarpment, Cerro Sipapo (Paráque) Amazonas, Venezuela, 1800 m, 14 Jan 1949, *Maguire & Politi 28340* (holotype, ♂ ? fl. NY).

Distribution. A shrub or small tree to 2 m, with seemingly dioecious flowers and "zig-zag," angled, sulcate branchlets occurring at 1500–1800 m in the drainage areas of Cerro Sipapo, Amazonas, Venezuela. VENEZUELA. Amazonas: frequent near slope savanna between Savanna Camp and West Peak, *Maguire & Politi 27802* (♀ fl. NY), infrequent on North Mountain, *28595* (♀ ? fl. NY); Bolívar: infrequent in quebradas, lateral south drainage of "North Valley," Cerro Guaiquinima, Río Paragua, *Maguire 32916* (♂ fl. NY).

The last-cited specimen from Bolívar, except for the very small leaves, blackish-pubescent beneath, and the blackish-pubescent branchlets, can not be separated from the type material of Amazonas. Without more material from the area, however, I hesitate to make a variety on these often variable characters.

The general inflorescence-type of the species suggests a relationship with *Ocotea lasseriana*, from which it may be separated by a difference in venation, the reticulation of the leaves of *O. atrata* very nearly equaling in prominence and in some even obscuring the lateral nerves, which diverge at a broader angle from the costa than those of the former.

There is a possible alliance with *O. adenotrachelium* (Nees) Mez, described from the Poeppig collection made at Ega on the Solimoẽs River, Brazil. The longer, very coriaceous, distinctly petiolate leaves of *O. atrata*, however, are not cordate, but obtuse or rounded. The consistently more slender branchlets of the former appear neither "zig-zag" nor sulcate.

Ocotea nilssonii C. K. Allen, sp. nov. Fig. 50.

Arbor ad 15 m alta, gemmis anguste tenuiterque ovoideis, griseo-pubescentibus, ramulis juventute satis robustis conspicue striatis angulatis atro-rubescentibus, dense, minute, adpresseque fulvo-brunneo-pubescentibus mox teretibus fulvo-rubescenti-maculosis, pubescentibus. Folia alternata, petiolis crassis minute fulvo-rubescenti-pubescentibus valde canaliculatis, 10–15 mm longis et 2–3 mm latis, laminis supra glabris subtus minutissime inconspicueque pubescentibus percoriaceis, supra atro-viridescentibus subtus pallidioribus, saepe in sicco glaucescentibus, oblongo-ellipticis 14.5–18 cm longis, 5–7 cm latis, ad basim plerumque rotundatis ad apicem abrupte acuminatis vel acutis, margine revolutis, penninerviis, costa supra obscura leviter subtus conspicue elevata crassa brunnescenti fide coll., nervis 8–12-paribus supra obscuris subtus leviter graciliterque elevatis, brunnescentibus fide coll., ad angulo 55° divergentibus, rete venularum ut videtur laxo, obscuro. Inflorescentia juvenilis axillaris subterminalisque, minute adpresseque subferrugineo-pubescens stricte racemoso-paniculata, ad 6 cm longa, brevipedunculata. Flores immaturi ut videtur dioici ♂ ? ante anthesin, perianthii lobis late ovatis, tubo ± indistincto; staminibus ser I & II antheris ovatis truncatis quam stylo crasso duplo vel plus longioribus, ser III subquad-

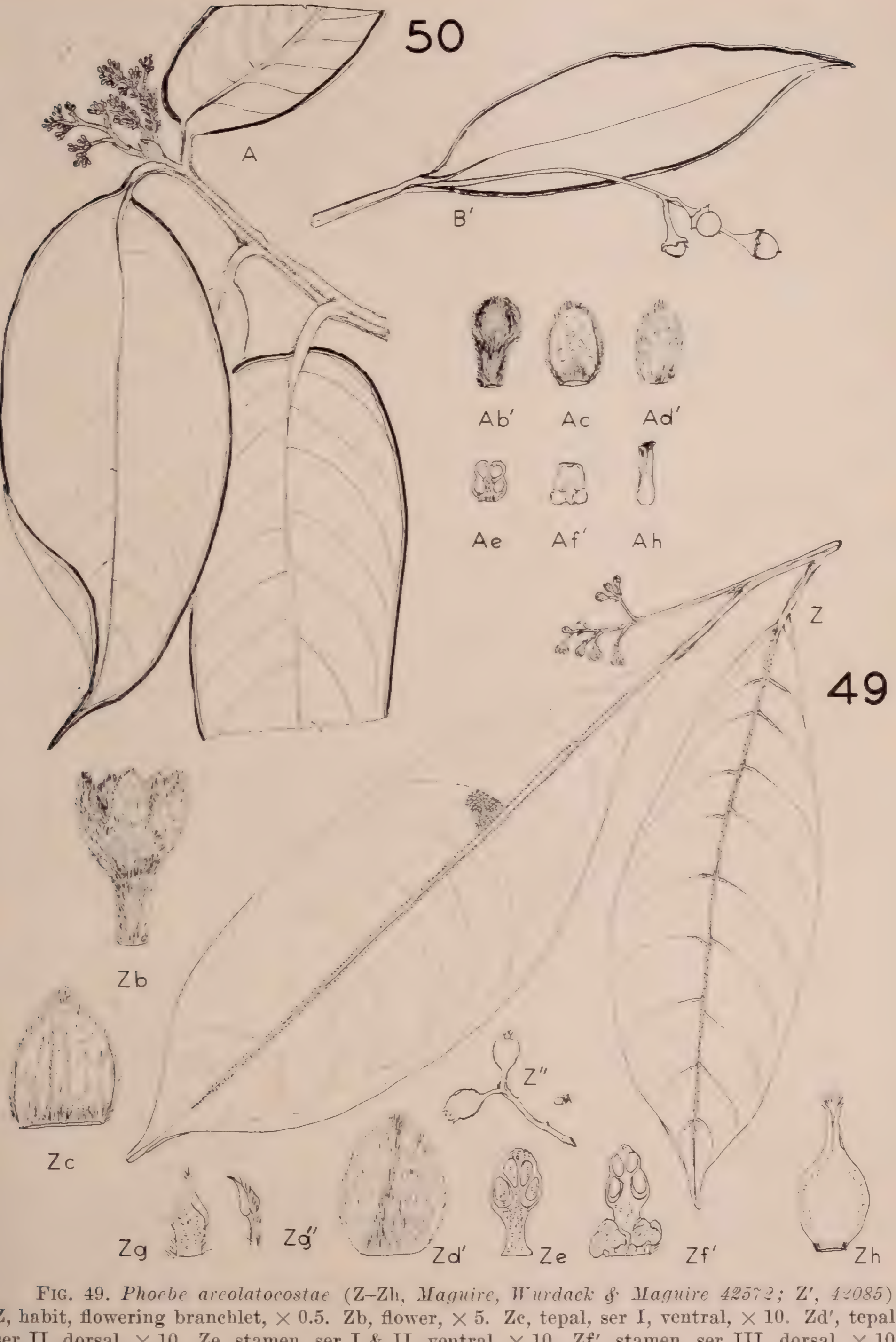


FIG. 49. *Phoebe areolatocostae* (Z–Zh, *Maguire, Wurdack & Maguire 42572*; Z′, *42085*). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc, tepal, ser I, ventral, × 10. Zd′, tepal, ser II, dorsal, × 10. Ze, stamen, ser I & II, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zg, staminodium, ser IV, ventral, × 10. Zg″, staminodium, ser IV, lateral, × 10. Zh, ovary, × 10. Z″, fruit (young), × 0.5. FIG. 50. *Ocotea nilssonii* (A–Ah, *Steyermark & Nilsson 461*; B′, *Steyermark 75477*). A, habit, flowering branchlet, × 0.5. Ab′, flower bud, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Ah, aborted ovary, × 10. B′, fruiting branchlet, × 0.5.

rangularibus quam ser I & II longioribus, biglandulosis, glandulis magnis; gynoecio abortivo, substipitato gracili, ovario anguste ellipsoideo, stigmate subsessili valde 2-lobata. Flores ♀ ignoti. Infructescentia aliquantum robusta, minute pubescens, ad 6 cm longa, rubescens. Fructus immaturus? viridis fide coll., subglobosus, apiculatus, 7–8 mm diam., cupula vadose pateriformi, 1.5–2 mm longa et 5–7 mm diam., leviter lobata, tepalis persistentibus expansis, pedicello ad 5 mm longo subobconico glabrescenti ad apicem ad 2 mm lato subtenta.

Type. Tree 15 m, leaves coriaceous, deep, dark green above, pale green beneath with brownish midrib and nerves, flowering rachis ferruginous, flower buds pale green, vicinity of campamento 125, vicinity of Cerro Uei, between Luepa and Cerro Venamo, Bolívar, Venezuela, 1100 m, 22 Apr 1960, *J. A. Steyermark & S. Nilsson 461* (holotype ? ♂ fl. NY).

Distribution. Small tree with dioecious flowers from the sandstone area of Bolívar, Venezuela, occurring on Chimantá and westward in the Caroní region, besides in the type locality. VENEZUELA. Bolívar: along southwest-facing sandstone bluffs of Chimantá-tepuí (Torono-tepuí), near southern corner, *Steyermark 75477* (fr. NY); bosques del Cerro Acopán, Caroní, *Cardona 2259* (fr. US.)

The very coarse, leathery leaves of this species, with obscure venation except for the prominent and thick midrib, appear at first glance to resemble those of *O. adenotrachelium* described by Nees from the Solimoes and later reported by Mez from Rio Negro as well. The latter, however, is distinguished by the very short petioles and the cordate leaf-blades which are usually more attenuately acuminate. The young, unexpanded inflorescences of *O. nilssonii* (which may be pistillate, though at this stage it is difficult to be certain) would at maturity very probably reach a greater length and breadth. The blackish-red branchlets, angled towards the tips, maintain pubescence at maturity, though this is more scattered and more fulvous than ferruginous. At first glance, the fruiting material seems very different from the type, the leaves being much smaller. The general character of the branchlets, with the minute, fulvous, persistent pubescence not obscuring the dark reddish color, and the texture, shape, and venation of the leaves of both type and fruiting material are essentially the same. It is possible that the flowers are hermaphrodite, but more mature specimens are necessary for complete certainty on this point.

The leaf-texture and color in the dried state call to mind *Ocotea rodiei* (Schomburgk) Mez, described from British Guiana, the type material of which is in late flowering stage. The leaves of the latter are acute at the base and the subterminal inflorescence much shorter than those of the above-described species. The branching of *O. rodiei* is characteristically more horizontal than is usually noted in the Lauraceae.

Ocotea cowaniana C. K. Allen, sp. nov. Fig. 48.

Frutex parva vel arbor depauperata fide coll., gemmis ovoideis longe acuminatis minute papillosis, ramulis robustis, brunnescentibus mox cinereis rimosis, longitudinaliter conspicueque lenticellatis striatis teretibus petiolorum cicatricibus numerosis. Folia alternata, saepe ad summam dense aggregata, petiolis crassis glabris viridescentibus planis vel leviter canaliculatis ad 10 mm longis et ad 3 (–5) mm latis saepe subtus ad basim gibbosis, laminis utrinque glabris coriaceis et flavo-viridescentibus, ellipticis, (8–) 13–15 cm longis et (3–) 4–6 cm latis, ad basim acutis, saepe attenuate decurrentibus, ad apicem variabilibus ± abrupte acuminatis acutisve raro obtusis vel subemarginatis, penninerviis, costa crassa flava, in sicco ad basim lata ad 3 mm et supra ± ad basim plana vel leviter impressa ad basim leviter subtus conspicue elevata striataque, nervis 8–10-paribus flavis gracillimis utrinque ± obscuris supra obscure subtus conspicue leviterque elevatis, ad angulo 56–45° divergentibus, rete venularum supra obscuro subtus conspicuo saepe subtus minute areolato. Inflorescentia axillaris subterminalisque, satis robusta, utrinque glabra, pallide rubescens, pauciflora, anguste racemoso-paniculata, 7–8 cm longa, pedunculo 4–5 cm longo. Flores dioici? ♀ 3–4 mm longi, pedicello ad 4 mm longo; perianthio flavescenti fide coll., subcampanulato tenui glabro, lobis exterioribus oblongis ad 2 mm longis et 1.4 mm latis, interioribus ad 1.7 mm longis et 1.2 mm latis, tubo ad 1 mm longo; staminibus ad 0.9 mm longis, antheris ser I & II ovatis filamenta satis crassa subaequantibus, ser III antheris subquadrangularibus quam filamentis biglandulosis, glandulis magnis brevistipitatis robustis brevioribus, ser IV ? 0; gynoecio ad 1.6 mm longo, ovario ± subgloboso quam stylo crasso duplo longiore, stigmate triangulari-discoideo. Infructescentia immatura, robusta, glabra, brunnescens, ad 10.5 cm longa. Fructus immaturus, viridis fide coll., ut videtur ellipsoideus, apiculatus, cupula cyathiformi, 6-dentata, perianthii lobis persistentibus mox deciduis?, pedicello obconico subtenta. Flores ♂ et fructus maturus ignoti.

Type. Shrub 1 m, flowers yellowish, occasional in cumbre about 6 km south of Camp Caño head along west rim, Serranía, Parú, Río Parú, Caño Asísa, Río Ventuari, Amazonas, Venezuela, 2000 m, 7 Feb 1951, *R. S. Cowan & John J. Wurdack 31303* (holotype, ? ♀ fl. NY).

Distribution. Shrub or spare tree 1–2 m with dioecious? flowers, known only occasionally in sabanita in cumbre of the type locality, at 2000 m. VENEZUELA. Amazonas: occasional in cumbre about 6 km north of Camp Caño head along west rim, *Cowan & Wurdack 31247* (y. fr. NY), in sabanita in cumbre just north of head of Camp Caño, *31106* (y. fr. NY).

The yellowish-green leaves, with prominent yellowish midribs and dense, more or less yellowish reticulation rather obscure above but conspicuous below, set this apart from other ocoteas. Associated with *31247* is a branchlet with mature fruit which, however, does not belong to this species. It may be allied with *Ocotea complicata* (Meissner) Mez from Bahia, the flowering type of which it resembles, although the branchlets of the latter are clothed with more or less dense, closely appressed pubescence, the petioles terete rather than flat at the apex, and the leaf-blades complicate and less conspicuously reticulate. The material of *O. cowaniana* is infected with a fungus, the blackish mycelium of which is visible on the stems and leaves.

The alliance of the species is not too readily discernible from the material at hand. The leaf-texture and general habit recall ocoteas of Central America. In general habit it resembles *Weberbauer 6428* (syntype of *O. piurensis* Mez, isotype, fl. GH), but differs in the much broader, more plane petiole and midrib of the leaves, and the brownish, sulcate branchlets. *Weberbauer 6352* (syntype of *O. piurensis* Mez, isotype, GH) more nearly approaches the type of *Ocotea obtusifolia* H. B. K., based on a fruiting branch of Humboldt's specimen from Quindi, Colombia. I have seen only a photograph of the latter type, however.

Ocotea canaliculata (Richard) Mez, Jahrb. Bot. Gart. Berlin **5**: 361. 1889.

Laurus canaliculata Richard, Act. Soc. Hist. Nat. Paris **1**: 108. 1792.
Oreodaphne cayennensis Meissner in DC. Prodr. **15**^{1}: 133. 1864. (holotype, ♂fl, *Patris?*)

Type. Batava ad flumen Para, *Richard* (holotype ♀ fl.).

Vernacular Name. Laurelillo (Wurdack & Monachino).

Distribution. A tree or shrub, the many-flowered inflorescences of which are ferruginous-tomentellous with dioecious flowers, occurring in French and Dutch Guiana, possibly in Brazil according to Mez, and the Venezuelan material cited below extending the range into the crystalline shield areas of the latter area. SURINAME. Along Line A, Plateau B, Nassau Mountains, Marowijne River, *Maguire 40791* (♀ fl. NY). VENEZUELA. Bolívar: occasional on lateritic clay near radio tower, Iron Mining Co., of Venezuela mine at El Pao, *Maguire & Wurdack 35809* (♀ fl. NY); Delta Amacuro: El Palmar-Raudal Trail, upper Río Toro Drainage, Serranía Imataca, *Wurdack & Monachino 39662* (fr. NY).

The taxon here considered agrees in all respects with the fragment of the type of *Oreodaphne cayennensis* which Mez has assigned to *O. canaliculata*, but does not appear to be the same as the specimen in the photograph of "Patris?." If there is a discrepancy the earlier name should, of course, be applied to the material that has been going under the name of *O. canaliculata* for the past half-century. Examination of the type (*Patris?*) is necessary to resolve the nomenclatural problem, and Richard's specimen should retain the epithet "canaliculata."

Ocotea duidensis Moldenke in Gleason, Bull. Torrey Club **58**: 363. 1931.

Flores dioici, ♂ ad 3 mm longi, pedicellati, pedicellis ad 0.7 mm longis, perianthio subcampanulato fragranti, eburneo-luteo fide coll., membranaceo, lobis ovatis, sparse pubescentibus, ad apicem papillosis, ad 1.6 mm longis, tubo ad 0.7 mm longo; staminibus ser I & II antheris subquadrangularibus quam filamentis satis crassis longioribus, ser III ad 1 mm longis, filamentis biglandulosis, subaequantibus, glandulis subsessilibus magnis, ser IV abortivis, stipitatis; gynoecio abortivo ad 0.6 mm longo, aliquantum pubescenti.

Type. Tree 40 ft high, flowers pink-white, Aguita, slopes of Mount Duida, Amazonas, Venezuela, 4000 ft, Aug 1928–Apr 1929, *G. H. H. Tate 910* (holotype, ♀ fl. NY).

Distribution. Shrub or small tree to 40 ft, in savannas or dry, rocky thickets, described first from Mount Duida, Amazonas, known now to occur east in the sandstone region of Bolívar and adjacent Serra Tepequém in Brazil. VENEZUELA. Bolívar: Gran Sabana, between Mission of Santa Teresita de Kavanayén northwest to Río Karuai, on large mesa, *Steyermark 59391* (fr. A, F); en sabanas, Kavanayén, *Lasser 1723* (♂ fl., F, US), dense forest along Río Karuai between base of cerro and first ridge above Río Karuai, *Steyermark 60619* (♂ fl. F), along Río Karuai bordering savanna between base of Ptari-tepuí and Sororopán-tepuí, *60714* (♂ fl. F); en tomas de arenizca, entre Cerro Perai y las nascientes del Río Uaiparú, affluente del Ikabarú, Caroní, *Cardona 1867* (♂ fl. US); in calcetas de las orillas del Uaiparú, *1902* (♂ fl. NY). BRAZIL. Territorio do Rio Branco: occasional near east escarpment rim, Serra Tepequém, *Maguire & Maguire 40149* (fr. NY).

Ocotea schomburgkiana (Nees) Mez, Jahrb. Bot. Gart. Berlin **5**: 337. 1889.

Oreodaphne schomburgkiana Nees, Linnaea **21**: 519. 1848.

Syntypes. Demerara, im Brittischen Guiana, *Rich. Schomburgk 464* (♂ fl.), *1336* (♀ fl.), *1738* (♂ fl.) (isotypes, NY); Suriname, *Kegel 1302* (syntype not seen).

Vernacular Name. Tavan-yek (Arekuna, Bernardi).

Distribution. Shrub or tree of varying height, bearing dioecious flowers, occurring in coastal Dutch and British Guiana, westward into the adjoining sandstone areas of the Guayana region. BRITISH GUIANA. Occasional in forest on white sands overlying bauxite, east of Ituni, 35 miles south of Mackenzie, *Cowan 39237* (♀ fl. NY), occasional in margins of ''islands'' of forest in savannas, *39269* (fr. NY). VENEZUELA. Bolívar: (Hierba?) en calceta o sabanna de Urei, Río Chicanan, Alto Cuyuni, *Cardona 2773* (fr. NY), selvas del valle de Canaracarú, Alto Caura, *423* (fr. US); rainforest along Río Apácara, Apácara-tepuí, Chimantá Massif, *Steyermark 74650* (♀ fl. NY), wet, mossy forest with sandstone boulders, between Camp 3 and main line of sandstone bluffs, northwestern part of Abacapá-tepuí, *75090* (fr. NY); las orillas del Río Apacará, confluencia del Ancapá, region de Urimán, *Bernardi 1404* (fr. NY); on Cerro Negro Parado, an east-west crystalline range on right bank of Río Parguaza, just below El Carmen (about 50 river km from mouth), *Wurdack & Monachino 40984* (fr. NY).

An extremely variable species occurring widely within these areas. It is consistent in bearing leaves with usually prominent, loose reticulation on the upper surface, whereas on the lower surface, the reticulation is more compact. The small fruits are ovoid, tapering at the apex and apiculate, enclosed for one-third to one-half of their length by a thin-margined, hemispheric cupule, which, apparently owing to unequal growth, frequently appears to be suburceolate, at least in young stages. The aspect of the cited numbers collected by Steyermark, Bernardi, and Wurdack and Monachino appears at first glance to separate them from the typical material from British Guiana. The leaves are less broad and their venation dissimilar in that the reticulation on both surfaces is more compact as well as minute, in contrast to the loose reticulation above and the somewhat more dense reticulation beneath the leaf-blade of the syntypes. In other respects, the specimens from Venezuela closely resemble Schomburgk's numbers.

Ocotea sanariapensis Lasser, Bol. Téc. Caracas **3**: 12. *pl. 7.* 1942.

Type. Arbusto de 4 m de altura con flores de color amarillo pallido, pequeñas; en el medio del Río Sanariapo, cerca de su desembocadura, y casi completamente sumergido; la corteza es gris, la albura amarillenta y el duramen moreno, Puerto Ayacucho, Amazonas, Venezuela, 100 m, 25 May 1940, *Llewelyn Williams 13051* (isotype, ? ♂ fl. F).

Distribution. Shrub or small tree with possibly polygamo-dioecious flowers growing chiefly in sandy, wet soil often periodically inundated on the banks of the Río Negro and its tributaries in Bolívar and Amazonas, Venezuela; and occasionally at the edge of savannas at the base of the neighboring Cerro Yapacana; and along Río Guaviare, Comisaría del Vichada, Colombia. VENEZUELA. Bolívar: frequent along Caño Coroso (Río Caripo) between Lago Coroso and Río Orinoco, *Wurdack & Monachino 41187* (♂ fl., fr. NY); Amazonas: Puerto Ayacucho, *Williams 14960* (fr. A); in Sabanita on right bank of Caño Cupueni, 0.5 km above mouth, region of San Fernando de Atabápo, *Maguire, Wurdack & Bunting 37687* (♀ fl. NY); Caño Cupaven, Río Orinoco at mouth of Río Atabápo, *Level 69* (♂ fl. NY); occasional in sandy soil of clearing above Caño Guasuriapana, 1 km above San Fernando de Atabápo, *Maguire, Wurdack & Bunting 36248* (fr. NY); occasional in scrub forest near Yapacana caño laguna, northwest base of Cerro Yapacana, *Maguire & Wurdack 34494* (fr. NY), edge of Savanna No. 1, *34498* (♂ fl. NY); terrenos arenosos y humedos a orillas del Río Orinoco en los alrededores de San Fernando, *Molina & Barkley 18 V 201* (♂ ? fl. US). COLOMBIA. Comisaría del Vichada: selvas densas en suelos arcillosos y ricos a orillas del Río Guaviare en la region de Amanabel (a bocas del río), *Molina & Barkley 18 VI 233* (♀ fl., fr. US).

The species superficially resembles *O. florulenta* (Meissner) Mez but is distinguished by the possibly polygamo-dioecious flowers borne in sturdier, smaller and more strict inflorescences, and by its oblong-ellipsoid fruit subtended by a partially enclosing, shallow, suburceolate cupule. The prominent, loose reticulation of the leaves, as well as their shape, recalls the widespread Antillean species, *Nectandra coriacea* (Swartz) Griseb.

Ocotea sanariapensis bears fruit suggesting that of *O. schomburgkiana* which differs in the larger, hemispheric, frequently in the younger stages suburceolate cupule and broader, more elliptic, usually more coriaceous, loose but less regularly reticulate leaf-blades.

The recent collections of flowering material from The New York Botanical Garden expeditions to Venezuela bear dioecious flowers. The fruit-cupule tends to be more flaring and less suburceolate, and the leaves often more lanceolate-elliptic. In other respects, however, they agree with the type of *O. sanariapensis.* The presence of dioecious flowers points to the possibility that the species may be polygamo-dioecious. However, the taxon is here discussed with the several species it most resembles.

Ocotea florulenta (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 309, 1889.

Oreodaphne florulenta Meissner in DC. Prodr. **15**^{1}: 125. 1864.

Type. In vicinibus Santarém, Pará, Brazil, Apr 1850, *Spruce 812* [*Ocotea* (1)], (isotype, ♂ fl. NY).

Vernacular Name. Laurel Blanco, Laurel Negro (Williams).

Distribution. Shrub or small tree with dioecious flowers growing on wooded, periodically inundated banks of the Amazon, Rio Negro and Rio Orinoco and their tributaries in Brazil and Venezuela, at an altitude of 100–125 m. VENEZUELA. Amazonas: en las márgenes anegadas y arboreadas del Caño Macasi, Capihuara, Alto Casiquiare, *Williams 15598* (♂ fl. F, US), *15769* (♀ fl. F, US); en los sitios sombreados en la selva alta, frondosa, fuera de las inundaciones periodicas, San Carlos, Río Negro, *Williams 14461* (fr. A, US); frequent on river banks above Cuao Creek, Río Orinoco, *Maguire & Politi 27391* (fr. NY).

The species resembles *Ocotea fallax* (Miquel) Mez from the Guianas but differs, according to Mez, in the globose fruits subtended by a shallow cupule with expanded, obconical pedicel, as opposed to the subglobose fruit of *O. fallax* which is subtended by a smaller cupule seated on a scarcely thickened pedicel. With the fragmentary fruit and flowering material of cited specimens and no available types of *O. fallax,* it is difficult to be certain that Mez was justified in maintaining Miquel's species.

It is with hesitation that I cite the following fruiting specimens under *O. florulenta.* The branchlets are sturdier in every way than those of *Spruce 812;* the leaves are more coriaceous and tend to be larger, characteristics not significant in themselves; but, when coupled with a much coarser infructescence with scarcely expanded pedicels, they assume more importance. Because these specimens are not to be distinguished by floral or fruiting characteristics, they are placed here for the time being. It is entirely possible that with more material available, they may prove to be worthy of at least varietal rank under *O. florulenta.*

BRAZIL. Amazonas: Secus Rio Negro, inter S. Gabriel et Barcellos, *Spruce 3791* (fr. isotype of *Gymnobalanus Sprucei* Meissner,[18] GH, NY). VENEZUELA. Amazonas: along Río Cuao, *Maguire & Politi 28153* (fr. NY); frequent along Caño Cupueni, right bank of the Río Orinoco opposite mouth of Río Atabápo, *Maguire, Wurdack & Bunting 36202* (♂ fl. NY).

Mention might be made here of the possibility of variation in species resulting from seasonal flooding. It is conceivable that a complex growing for a long period under these conditions might be more susceptible to hybridization, which might perhaps, if it is true, account in part for the instability of certain groups that occur under such conditions. Years of painstaking collecting and field observation would be necessary before any conclusive evidence pertaining to such species could be offered with confidence.

Ocotea glaucophylla Moldenke in Gleason, Bull. Torrey Club **58**: 364. 1931.

Inflorescentia axillaris, brevis, erecta, ad 3 cm longa, rubescens, glabra. Flores dioici, ♂ ad 3.5 mm longi, pedicellati, pedicellis ad 1.5 mm longis, perianthio ± campanulato, gracili glabri, lobis viridescenti-flavis fide coll., ovatis, marginibus papillosis, 1.2–1.3 mm longis, tubum subaequantibus; staminibus ser I & II, ad 0.7 mm longis antheris late ovato-truncatis, apiculatis filamenta satis gracilia aequantibus ser III antheris quadrangularibus ad 1 mm biglandulosis, glandulis magnis filamenta subaequantibus, ser IV O, vel abortivis; gynoecio vel O; ♀ flores ignoti.

Type. Bush, with leaves held edgewise to the sun, flowers small, white, calyx persistent, crests of Savanna Hills, summit of Mount Duida, Amazonas, Venezuela, 4400 ft, Aug 1928–Apr 1929, *G. H. H. Tate 763* (holotype, fr. NY).

Distribution. Slender shrub 1–2 m, described from fruiting material alone, growing on crests of Savanna Hills on summit of Mount Duida, Amazonas, at 1000–1500 m; also in the Chimantá Massif, on forested slopes of Torono-tepuí, Bolívar, Venezuela from 2000 to 2150 m. VENEZUELA. Amazonas: type locality, *Steyermark 58274* (♂ fl. F). Bolívar: open dwarf forest, north-facing slopes on summit above valley of Caño Mojado, Torono-tepuí, Chimantá Massif, 2030–2150 m, *Steyermark & Wurdack 1038* (♂ fl. NY), south-facing, forested slopes above valley of South Caño, on summit, *1102* (♂ fl. NY).

This small, coarsely reticulate and leathery-leaved species is striking in that the leaves are all stiffly erect, densely clustered near the tips of the stout, grey branchlets which are also rigidly curved upwards. The flowering material cited, although generally similar in leaf-habit to the type, lacks the glaucescent lower leaf-surface which gave the species its name.

Ocotea simulans C. K. Allen. sp. nov. Fig. 52.

Arbor vel arbor fruticosa ad 15 m alta, gemmis gracilibus minute sericeo-ferruginosis, ramulis teretibus substriatis pallide ferruginoso-pubescentibus mox glabris atro-griseis. Folia alternata, petiolis satis gracilibus molliter pubescentibus mox glabrescentibus atratis, ad 15 mm longis et 1.5 mm latis, laminis supra adpresse pubescentibus mox glabrescentibus, venis exceptis, subtus juventute claro argenteo-sericeo-pubescentibus mox sparsiore fulvo-sericeo-pubescentibus,

---

[18] Considered by Mez to be conspecific with *O. florulenta.*

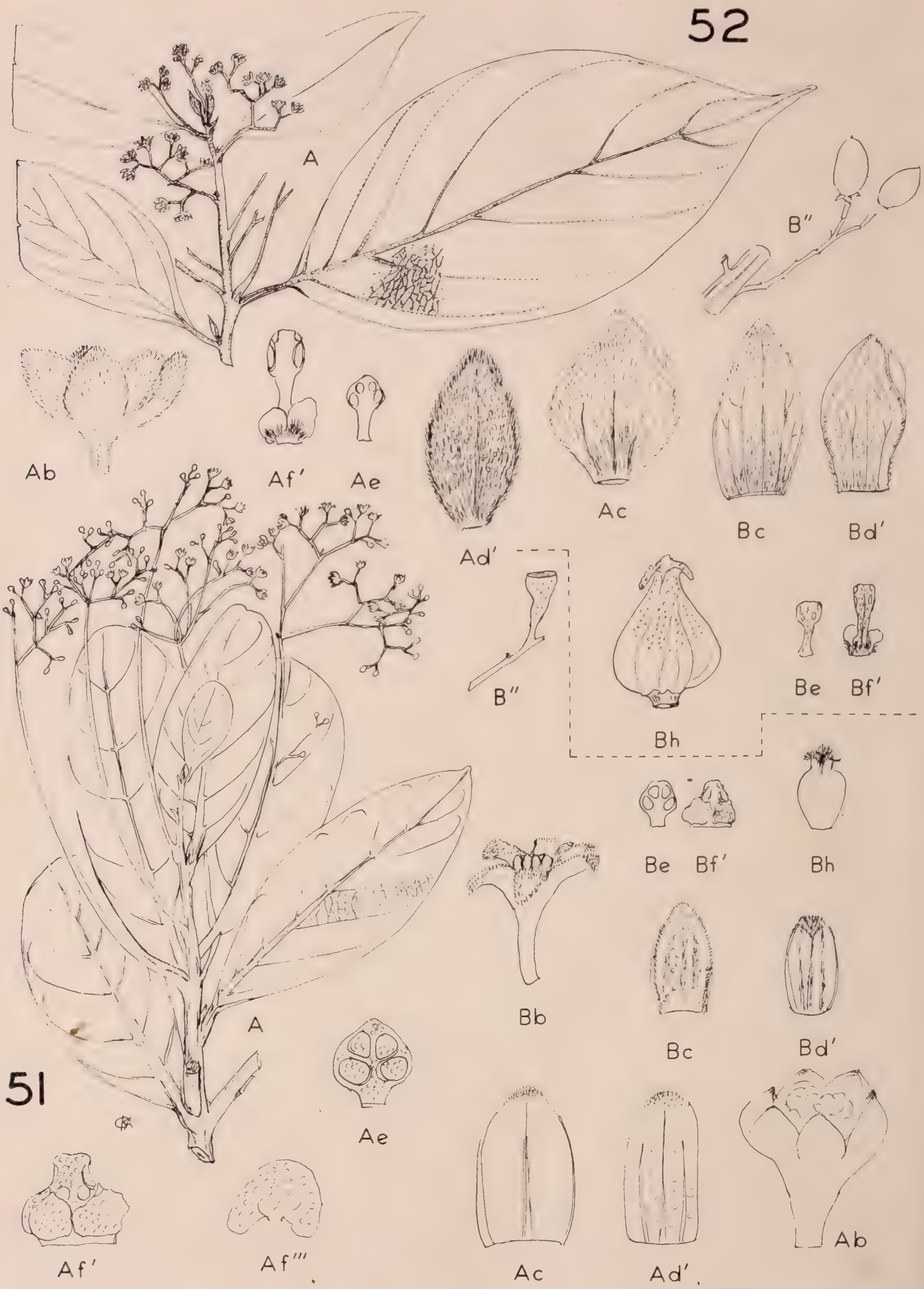

52
A
B″
Ab
Af′
Ae
Ad′
Ac
Bc
Bd′
B″
Bh
Be
Bf′
Be
Bf′
Bh
Bb
Bc
Bd′
A
51
Ae
Af′
Af‴
Ac
Ad′
Ab

FIG. 51. *Ocotea neblinae* (A–Af‴, *Maguire, Wurdack & Maguire 42059* ♂; Bb–Bh, B″, *Maguire, Wurdack & Bunting 36585* ♀). A, habit, flowering branchlet, × 0.5. Ab, flower, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Af‴, ser III, gland, × 15. Bb, flower, × 5. Bc, tepal, ser I, ventral, × 10. Bd′, tepal, ser II, dorsal, × 10. Be, sterile stamen, ser I & II, ventral, × 10. Bf′, sterile stamen, ser III, dorsal, × 10. Bh, ovary, × 10. B″, fruit, × 0.5. FIG. 52. *Ocotea*

membranaceis ellipticis, (3.5–) 10–17 cm longis et (1–2–) 5–7 cm latis, ad basim acutis saepe obliquis ad apicem variabiliter emarginatis, obtusis, subrotundatis acuminatisve, acumine ad 2 cm longa, penninerviis, costa et nervis supra subplanis, subtus elevatis pubescentibus, nervis 4–5-paribus, ad angulo 35° divergentibus, rete venularum supra ± inconspicuo subtus frequenter in pilis obscuro. Inflorescentia subterminalis axillarisque, gracilis sed ± rigida minute subferrugineo-sericea vel fulvo-sericea, multiflori-paniculata, ad (6–) 15 cm longa, pedunculo aliquantum gracili 1–3 cm longo. Flores dioici 4–4.5 mm longi, pedicellis ad 2 mm longis, perianthio lato-campanulato rubescenti-flavo fide coll., lobis utrinque pubescentibus, exterioribus late obovatis, interioribus angustioribus, tubo brevi ad 0.5 mm longo; ♂ staminibus ser I & II ad 0.9 mm longis filamentis gracilibus ad basim pubescentibus antheras subquadrangulares ovato-truncatasve subaequantibus, ser III 1.8 mm longis filamentis biglandulosis, glandulis parvis basilaribus viridescentibus fide coll., stipitatis antheras quadrangulares subaequantibus, saepe locellis superioribus obscuris laterali-introrsis, interioribus extrorsis, ser IV O; gynoecio O; ♀ flores ♂ simulantes, lobis exterioribus ± spathulatis, staminibus ser I, II & III sterilibus, ser IV O; gynoecio ad 4 mm longo, glabro, ovario subrotundo vel late ovoideo, brevistipitato, stigmate magno lobato stylum ad 3 mm longum ferenti. Fructus viridis fide coll., juventute ovoideus, mox ellipsoideus, apiculatus, 15 × 10 mm, cupula parva discoidea, ad 5 mm diam., minute 6-lobata recurvata, lobis ad margines scariosis canescentibus, pedicello obconico 5–6 mm longo ad apicem 2 mm lato subtenta.

Type. Bushy tree 3–8 m, flowers reddish-yellow, fruit green, frequent along Río Casiquiare just above Capihuara, 100–130 m, Amazonas, Venezuela, *J. J. Wurdack & L. S. Adderley 43169A* (holotype, ♂ fl. NY); *43169B* (isotype, ♀ fl., fr. NY).

Distribution. Shrubby tree to 10 m, bearing reddish-yellow or white flowers, or cream tinged with pink, occurring along the Río Pargueni in Bolívar, and the Ríos Orinoco and Casiquiare and their tributaries in Amazonas, Venezuela and possibly extending down into Colombia along the Rio Vaupés from 190–200 m. VENEZUELA. Bolívar: occasional along margins of Río Pargueni 1–10 km above mouth, *Wurdack & Monachino 39775* (♂ fl. NY). Amazonas: occasional along Río Siapa near mouth, *Maguire & Wurdack 34859* (fr. NY); en las márgenes arboreadas y periodicamente anegadas del alto Casiquiari, Capihuara, *Williams 15682* (fr. A); Cariche, midway between San Antonio and mouth of Río Cunucunuma, *Wurdack & Adderley 43064* (♀ fl. NY); en los sitios medio abiertos a lo largo de las lagunas y de las rebalsas, Esmeralda, Alto Orinoco, *Williams 15367* (♀ fl. A). COLOMBIA. Comisaría del Vaupés: orilla del Río Vaupés, entre Mitú y Mirití, *Cuatrecasas 6911* (fr. F), *6914* (fr. US), *6922* (fr. F, US), Mitú, *7235* (♀ fl. US).

This species superficially resembles *Endlicheria bracteolata* (Meissner) Allen, but the narrower leaves with veins not subtriplinerved and the flower-structure distinctly that of *Ocotea* at once set it apart. The cupule of *Endlicheria* encloses the fruits for at least one-third of their length, as opposed to the small, disklike cupule to which the fruit of the present species is attached at the extreme base.

---

simulans (A, Ab–Af, *Wurdack & Adderley 43169 A* ♂; Bc–Bh; B″, *43169 B* ♀). A, habit, ♂ flowering branch, × 0.5. Ab, flower, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Bc, tepal, ser I, ventral, × 10. Bd′, tepal, ser II, dorsal, × 10. Be, sterile stamen, ser I & II, ventral, × 10. Bf′, sterile stamen, ser III, dorsal, × 10. Bh, ovary, × 10. B″, fruit, × 0.5.

The Colombian number *6922* is in the post-anthesis–young-fruiting stage which shows no distinctive characteristic to place them to genus. The habit of the leaves and inflorescence, however, agrees very well with that of the above species.

Ocotea sprucei (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 323. 1889.

> *Mespilodaphne sprucei* Meissner in DC. Prodr. **15**^{1}: 97. 1864 (only *Spruce No. 2149*); *Oreodaphne myriantha* Meissner in DC. Prodr. **15**^{1}: 120. 1864 (isotype, *Spruce 3069*, fl. NY) (excl. var.); *Ocotea myriantha* (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 332. 1889.

Type. Prope San Gabriel da Cachoeira, ad Rio Negro, *Spruce 2149* (isotype, ♂ fl. NY).

Vernacular Names. Laurel (Williams); Dahuri (Guariquena, Williams).

Infructescentia robusta, atro-rubescens, glabrescens, quam 7 cm amplior. Fructus caeruleus fide coll., griseo-brunnescens, in sicco oblongus, obtuse rotundatus, saepe fide coll. globosus subglobosusve, ad 16 × 10 mm, ad partem tertiam inclusus in cupula rubescenti fide coll., cyathiformi, 10–15 mm longa et 12–15 mm diam. ad marginem, et ad 7 mm alt., stipite ad 9 mm longo, pedicello satis incrassato, ad 5 mm longo ad apicem ad 2 mm lato.

Distribution. Small tree or shrub (large tree according to Mez) with cream-colored, dioecious flowers, found in Brazil along the Rio Negro and in Amazonas, Venezuela, along the Orinoco and its tributaries, and in the region of Río Guainía. VENEZUELA. Amazonas: in slope forest at Camp 3, Cerro de la Neblina, Río Yatua, *Maguire, Wurdack & Maguire 42592* (♂ fl. NY); Esmeralda Ridge at southeast base of Cerro Duida, *Maguire, Wurdack & Keith 41554* (♂ fl. NY); in Sabana Cumare on right bank of Caño Cumare (20 km above San Fernando de Atabápo, *Wurdack & Adderley 43769* (♂ fl., NY), occasional at edge of clearing, San Fernando de Atabápo, *42841* (♂ fl. NY); terrenos arenosos y humidos a orillas del Río Orinoco en los alrededores de San Fernando, *Molina & Barkley 18 V 200* (y. fr. US); en los Chiquichiquiales de Capihuara, Alto Casiquiare, *Williams 15573* (fr. F, US), en las sabanitas, en la boca del Caño Ichana, Bajo San Miguel, Río Guainía, *14919* (fr. A).

Spruce, according to Mez, has indicated that the type of *Mespilodaphne sprucei* is from a tall tree 40–45 m in height, and that the branchlets are densely ferruginous-tomentellous, the latter fact not borne out by an examination of the isotype.

The fruit of neither of the two species recognized by Meissner has been heretofore noted. The Chicago sheet of *Williams 15573* apparently belongs to the taxon that I consider to include both species exclusive of their varieties. Mez excluded the variety and all other collections cited by Meissner, retaining only the type of *M. sprucei* cited above.

It will be noted that Meissner placed his species in different tribes: *Mespilodaphne,* a genus of the Cryptocaryeae, with fruits entirely or partially included in the cupule; *Oreodaphne,* a genus of the Oreodaphneae, with fruits not included in the cupule. Since Meissner apparently had no fruits of *M. sprucei* and possibly, according to Mez, only an unattached fruit from the Göttingen Herbarium specimen of *O. myriantha,* it is difficult to understand his disposition of the two entities, for other differences given appear to be merely differences of degree and not factors of value for supergeneric delimitation.

?Ocotea punctulata Mez, Jahrb. Bot. Gart. Berlin **5**: 379. 1889.

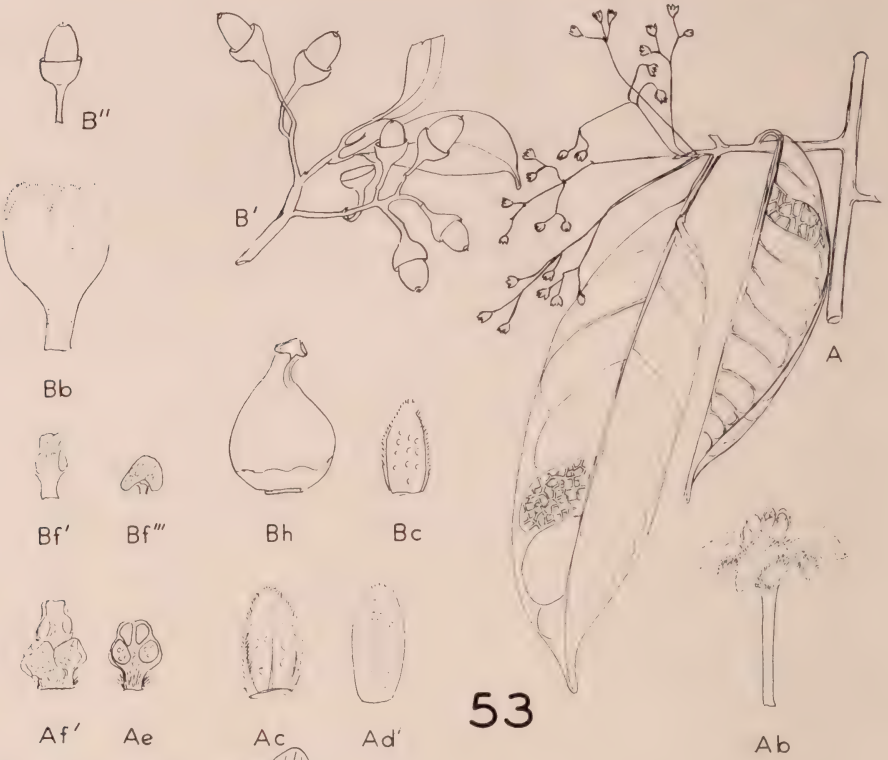
Type. "In Guyanae sylvis montanis in Gallica ad Kovrou," French Guiana, *Melinon 204* (fr., the first of several syntypes cited by Mez; possible isotype, fr. NY).

Distribution. Small tree known only from fruiting material growing at low altitudes in French and British Guiana and possibly on sandstone areas of western Venezuela. VENEZUELA. Amazonas: in forest on Piedra Arauicaua, Río Pacimoni-Yatua, *Wurdack & Adderley 43452* (fr. NY).

This species belongs to the widely occurring *O. caudata* complex which has been collected chiefly in the flowering stage. Apparently Mez had no flowers of his species at hand. The Melinon number which I have seen is conspecific with the Venezuelan collection. Other material more recently attributed to *O. punctulata* (*Brit. Guiana For. Dept. 2774* (*5573*) and *Tutin 208*) shows leaves with shorter veins more horizontally arcuate and extremely slender, sparsely flowered inflorescences up to 9 cm long which thicken only slightly in the fruiting stage. It would seem that flowering specimens of the species have not been collected to date, or more probably that they have not been recognized as belonging to this taxon. Another possibility is the fact that Mez' species may not belong to the genus *Ocotea*. A thorough study of the types of other species of the complex involved (*Ocotea urophylla, marowynensis, caudata, pauciflora,* etc.), not feasible at this time, may shed light on this interesting problem.

Ocotea directoramea C. K. Allen, sp. nov. Fig. 53.

Arbusto ad 2 m alt., gemmis gracilibus anguste ovoideis, attenuatis griseo-pubescentibus, ramulis gracilibus teretibus divaricatis ± leviter minute pubescentibus rubris, mox glabris, griseis. Folia alternata, petiolis debilo-gracilibus 0.8 mm longis, mox crassis ad 20 mm longis et ad 2 mm latis, manifeste canaliculatis, laminis utrinque glabris, juventute membranaceis mox coriaceis supra opacis subtus glaucis concoloribus, oblongis, (5–) 10–14 cm longis et (1.5–) 2–4 (–5) cm latis, ad basim rotundatis ad apicem longe graciliterque acuminatis, acumine ad 2 cm longa, margine recurvatis, penninerviis, costa utrinque conspicua, supra leviter subtus prominenter elevata, nervis 6–8-paribus obscurissimis ad angulo 50–65° divergentibus, rete venularum laxo, supra prominenti sed non nihil subtus acutideclinato, ± succulento. Inflorescentia axillaris subterminalisve gracili-pedunculata, pauciflora, gracillima, glabra, laxe paniculata, 8–10 cm longa, rachidibus fere filamentosis, rubescentibus. Flores dioici, ♂ ad 2 mm longi, longe pedicellati, pedicellis ad 4 mm longis; perianthio campanulato, gracili, lobis ± ovato-ellipticis ad 1.5 mm longis, intus leviter pubescentibus, tubo ad 0.5 mm longo; staminibus ser I & II ad 8 mm longis antheris ovatis subtruncatis obtusisve quam filamentis satis crassis duplo longioribus, ser III ad 1.2 mm longis antheris ± rectangularibus quam filamentis duplo longioribus, biglandulosis, glandulis magnis substipitatis roseis, ser IV 0; gynoecio 0; ♀ flores post anthesin perianthio albo fide coll., gynoecio ad 2 mm longo, ovario late ovoideo vel depresso-globoso, quam stylo satis crasso triplo longiore, stigmate conspicue triangulari. Infructescentia aliquantum incrassata rubescens ad 5 cm longa. Fructus ellipsoideus, in sicco ad apicem depresse truncatus, minute apiculatus, ad 15 mm longus et 7 mm diam., cupula cyathiformi, margine leviter undulata, 0.5–0.7 longa, pedicello obconico satis incrassato ad apicem 2.5–3 mm lato, ad 10 mm longo, subtenta.



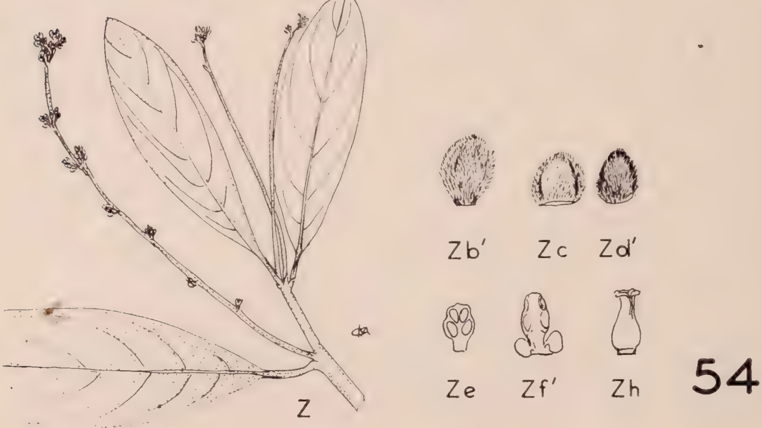


FIG. 53. *Ocotea directoramea* (A–Af′, *Maguire, Wurdack & Keith 41789* ♂; Bb–Bh, *Spruce 2485* [*A*] ♀; B′–B″, *Schultes & Pires 9112*). A, habit, ♂ flowering branchlet, × 0.5. Ab, flower, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Bb, flower, × 5. Bc, tepal, ser II, ventral, × 10. Bf′, stamen, ser III, dorsal, × 10. Bf‴, stamen, ser III, gland, × 10. Bh, ovary, × 10. B′, fruiting branchlet, B″, fruit, × 0.5. FIG. 54. *Ocotea perseiphylla* (*Schultes 10103*). Z, habit, flowering branchlet, × 0.5. Zb′, flower bud, × 5. Zc, tepal, ser I, ventral, × 10. Zd′, tepal, ser II, dorsal, × 10. Ze, stamen, ser I & II, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zh, ovary, × 10.

Type. Shrub 2–3 m, inflorescence branches red-tinged, flowers cream, occasional along Pimichín-Yavita trail near Pimichín, Amazonas, Venezuela, 120–140 m, 10 Oct 1957, *Bassett Maguire, John J. Wurdack & William M. Keith 41789* (holotype, ♂ fl. NY).

Distribution. Shrub to 3 m in sabanitas or sandy caatingas along the Río Guainía in Venezuela and the Rio Negro and its tributaries in Amazonas, Brazil. VENEZUELA. Amazonas: occasional in sabanita 1 km west of La Ceiba, Caño San Miguel 2 km above Limoncito, *Maguire, Wurdack & Keith 41913* (♂ fl. NY). BRAZIL. Amazonas: prope Panuré ad Rio Uaupé, *Spruce 2485*[19] [A] (♀ fl. NY); Rio Vaupés between Ipanore and confluence with Rio Negro, *Schultes & Pires 9112* (fr. F); caatinga arenosa, Arary-Pira, Rio Aiary, região Rio Negro, *Froes 21349* (♂ fl. NY).

The heavy texture of the leaves with the robust, more or less succulent venation is outstanding in the genus and, to a limited degree, only approached by that found in the type of *O. adenotrachelium*, also a Spruce number. The leaves of the latter collection, however, are much larger, up to 24 cm long and 9 cm broad, with a tendency towards an oblanceolate outline, a shorter acumen, a very short petiole, and a subcordate to cordate base.

There is a possible alliance with the *caudata* group, but the present species is separated by the very coarse-textured and heavily veined, larger, oblong-lanceolate, drip-tip leaves, contrasted with the exceedingly slender, almost filamentous, few-flowered inflorescences. The latter offer another striking resemblance, though weaker in habit, to those of the *caudata* group.

Ocotea yutajensis C. K. Allen, sp. nov. Fig. 56.

Arbor parva ad 4 m alta, gemmis gracillimis attenuato-acuminatis minute denseque griseo-sericeis, ramulis teretibus juventute dense sericeis mox griseis glabrescentibus atratis. Folia alternata, petiolis gracilibus pubescentibus glabrescentibus rubescentibus mox striatis, ad 15 mm longis et 1 mm latis, laminis utrinque glabris, raro costa glabrescenti, subcoriaceis, supra viridibus nitidis subtus opacis saepe brunnescentibus, (4–5–) 7–8 cm longis et 2–3 cm latis, ad basim obtusis vel subrotundatis, raro acutis, ad apicem obtuse attenuato-acuminatis vel obtusis, penninerviis, costa conspicua supra leviter impressa subtus conspicue elevata, nervis utrinque obscuris paribus reticulis obscuris, ad angulo 65–80° divergentibus, rete venularum laxo supra conspicue elevato subtus densiore minus conspicuo. Inflorescentia axillaris vel subterminalis, racemoso-stricte paniculata, ut videtur 5 cm vel minus glabrescens rubescens brevipedunculata. Flores dioici, pubescentes, ♂ ad 4 mm longi, pedicello ad 1.5 mm longo, perianthio suburceolato, lobis recurvatis, ovatis vel subspathulatis, ad 1.8 mm longis, staminibus ser I & II ad 1.3 mm longis, antheris ovatis, filamenta satis robusta pubescentia subaequantibus, ser III ad 1.5 mm longis biglandulosis, ser IV variabilibus, ad 0.5 mm longis squamosis vel capitatis; ♀ flores 3–3.5 mm longi, pedicellati; perianthio infundibuliformi, viridescenti fide coll., membranaceo, lobis exterioribus ovatis, interioribus angustioribus ad

---

[19] *Spruce 2485*, as represented in Gray Herbarium and Herb. Vindob. Bot. Mus., according to a note by Dr. H. N. Moldenke in 1933 on The New York Botanical Garden specimen, is *Citharexylum scandens* Briq. & Spruce. To avoid confusion and to keep the identity of the sheet in question, I have given it the same number followed by "[A]." I have not seen any other Spruce number matching this lauraceous species, with which it might have been confused when the collections were distributed.

1.7 mm longis, tubo ca. 0.5 mm longo; staminibus sterilibus ser I & II membranaceis, antheris utrinque late ovatis quam filamentis brevibus satis crassis duplo longioribus, ser III biglandulosis, glandulis magnis, ser IV ad 0.4 mm longis; gynoecio ad 1.5 mm longo, glabro, ovario obovoideo, quam stylo crasso duplo longioribus, stigmate magno fulgenti-lobato. Infructescentia gracilis, ad 6 cm longa, glabra. Fructus immaturus ? ellipsoideus, 10 × 6 mm, cupula, ut videtur rubescenti, ad 5 mm longa et 8 mm lata, cyathiformi, stipite 6–8 mm longa et 5 mm alta, aliquando pedicello gracili subtenta. Fructus maturus ignotus.

Type. Small tree, flowers greenish, along left fork of Caño Yutaje, Cerro Yutaje, Río Manapiare, Amazonas, Venezuela, 1250 m, 12 Feb 1953, *Bassett Maguire & Celia K. Maguire 35188* (holotype, ♀ fl., fr. NY).

Distribution. A small tree with dioecious flowers, known only from the type locality and possibly from the nearby Cerro Moriche, on the Río Ventuari of which the Río Manapiare is a tributary, from 400 to 1500 m, Amazonas, Venezuela. VENEZUELA. Amazonas: occasional small tree on Northwest ridge above Camp Yutaje in subxerophytic lowbush, *Maguire & Maguire 35396* (♂ fl. NY); on dry open east slope of Cerro Moriche, *Maguire, Cowan & Wurdack 30840* (♀ fl. NY).

A member of the densely reticulate-leaved group of ocoteas distinguished in the dried state by the conspicuously raised, loose, more or less uniform reticulation on the upper surface of the smallish, ovate-elliptic, long-acuminate leaves. This type of reticulation is found in varying degrees of density and prominence throughout the genus in the Guayana region, usually, however, with leaves characteristically ovate or rotund, not attenuate or acuminate at the tip.

The number from Cerro Moriche bears broader leaves only a few of which show the coarse reticulation of the material from the type locality. The floral structure is identical in all collections.

The species appears very close to the description of *Ocotea debilis* Mez, based on *Spruce 2368* from Panuré on the Rio Negro, which has loosely paniculate inflorescences pendulous from filiform axes. Also, the flowers and inflorescences of the latter are both described as red—not a significant fact in itself, for in many species, as has been noted by several collectors, yellowish flowers frequently turn red with age. The fruit of *O. debilis* is lacking, but Mez describes the cupule as being 6-dentate, a condition frequent in the young fruiting stage, the margin often becoming entire at maturity.

Ocotea celiana C. K. Allen, sp. nov. Fig. 57.

Frutex debilis, ad 1 m altus, gemmis parvis ovoideis acutis acuminatisve, ramulis striatis teretibus juventute cupreo- vel brunneo-tomentosis, mox aliquantum glabrescentibus, atro-rubescentibus vel griseis. Folia alternata, ± reflexa, petiolis robustis nutantibus, brunneo-tomentosis canaliculatis 6–8 mm longis et 2 mm latis, laminis supra flavo-viridescentibus ± sparse cupreo- vel brunneo-tomentosis mox glabris, costa nervisque exceptis, subtus dense cupreo- vel brunneo-tomentosis concavis percoriaceis minute areolatis subbullatisque, lanceolato-ellipticis, (5–) 8–9 (–10.5) cm longis et (1.5–) 2.5–3 (–4.5) cm latis, margine crasse revolutis, ad basim obtusis vel subcordatis, ad apicem attenuato-acuminatis acutisve, penninerviis, costa utrinque cupreo- vel brunneo-tomentosa, supra valde impressa, subtus valde elevata mox glabrescenti et flavo-viridescenti, nervis plerumque 5–8-paribus supra impressis glabrescentibus tenuissimis leviter arcuantibus, subtus conspicue elevatis dense cupreo- vel brunneo-tomentosis mox glabrescentibus et flavo-viridescentibus, ad angulo 55–80° arcuato-divergentibus, rete venularum supra laxo conspicuoque subtus pubescenti ± obscuro mox conspicuore. Inflorescentia debilis axillaris utrinque dense minuteque cupreo- vel brunneo-tomentosa, laxe paniculata, 7–13 cm longa, bracteis caducis, pedunculo debili, 2–4 cm longo. Flores dioici 3–4 mm longi, pedicello ad 5 mm longo, perianthio campanulato flavescenti carnoso, cupreo- vel brunneo-tomentoso, lobis late ovatis extus dense intus sparse pubescentibus, vel glabrescentibus, exterioribus ad 3 mm longis, interiores subaequantibus, tubo ad 0.7 mm longo; staminibus omnibus ut videtur biglandulosis, ♂ ser I & II saepe petalloideis sterilibus? ad 1.6 mm longis, antheris subrotundatis, sessilibus, glandulis adpressarum laciniarum consimilibus, ser III ad 1.7 mm longis antheris truncato-ovatis saepe antherarum locellis ut videtur abortivis quam filamentis robustis sublongioribus, ser IV subcordatis quam stipite pubescenti satis gracili brevioribus; gynoecio abortivo; ♀ florum staminibus ser I, II & III eis florum ♂ ± similibus, ser IV 0; gynoecio ad 2.3 mm longo, ovario ovoideo quam stylo robusto longiore, stigmate magno conspicuo patenti-lobato. Infructescentia satis gracilis, ferrugineo-pubescens, glabrescens, 10–12 cm longa. Fructus in sicco atro-purpureus vel viridescens, ± glaucus, ovatus, apiculatus, ad 15 × 10 mm, cupula campanulata, 5–6 mm longa, 8–10 mm diam., et 2–3 mm alt., 6-dentata mox perianthii lobis deciduis et margine ± plano, pedicello obconico rubro fide coll., in sicco saepe glauco, 6–8 mm longo, subtenta, vel subsessili.

Type. Weak shrub 1–2 m high, fruit-cup red, occasional in rocky places, Cerro Coro-Coro, Serranía Yutaje, Río Manapiare, Amazonas, Venezuela, 1500 m, 2 Mar 1953, *Bassett Maguire & Celia K. Maguire 35450* (holotype, ♂ fl., fr. NY).

Distribution. Weak shrub to 2 m known only from the type locality on rocky slopes or cliffs on or near summit in the Serranía Yatuje range in Amazonas, Venezuela, from 1500–2200 m. VENEZUELA. Amazonas: frequent on rocky summit, Cerro Yutaje, *Maguire & Maguire 35340* (♀ fl., fr. NY), occasional on rocky slopes and cliffs below summit, *35290* (♀ fl., fr. NY), occasional on summit, *35320* (♀ fl. NY).

One of the most striking species found in this area because of the leathery, sub-bullate, often subcordate, lanceolate-acuminate leaves, the lower surface of which bears a dense, coppery-brown tomentum in sharp contrast to the pale, yellowish-green upper surface. The weak habit of the shrub as a whole as well as the tomentose inflorescences also sets this apart. A microscopic examination of the flowers discloses two features that recall the floral structure of *Dicypellium*, a monotypic genus (with hermaphrodite flowers however), based on a collection by Martius from Mandiocca, Brazil, and cultivated in Pará and probably elsewhere for its fruit. The stamens of the two outer series are seemingly sterile, more or less petaloid, bearing flaplike appendages on the expanded filaments which appear to have a different origin from those glands of the third series. The latter are typical of those usually found in lauraceous genera, which arise from more or less well differentiated filaments. Although biglandular in a sense, the structure of the two outer stamens is not comparable to that found in the genus *Pleurothyrium*, which has stamens of the three outer cycles all bearing typical glands. In addition to the floral structure, the present species shows fruit characteristics also reminiscent of *Dicypellium*, the fruit being almost wholly exserted and seated in a shallow, somewhat campanulate cupule with persistent lobes. Until adequate material of the latter genus is available, the above-described taxon will be associated with *Ocotea*.

It is indeed a pleasure to name this species for Celia K. Maguire, co-collector on the expedition which yielded the numbers here cited.

Ocotea gracilis (Meissner) Mez, Jahrb. Bot. Gart. Berlin **5**: 327. 1889.

Oreodaphne gracilis Meissner in DC. Prodr. **15**^{1}: 128. 1864.

Type. Prope San Carlos, ad Rio Negro, Brasiliae borealis, 1853–54, *Spruce 2615* (syntype); *3081* (isotype, ♀ fl. NY).

Distribution. Shrub or small tree with fragrant, pale yellow or white or greenish, dioecious flowers, in sabanitas in the sandstone areas along the Río Negro, its tributaries and Río Guainía in Venezuela and the Río Vaupés and Río Inírida in Colombia, at an altitude of 100 to 250 m. VENEZUELA. Amazonas: en las sabanitas de San Carlos (type locality) de Río Negro, *Williams 14622* (? ♂ fl. F, US), *14654* (fr. F); borda das caatingas, Canal de Casiquiare, *Froes 21522* (♂ fl. NY); sabanita at Victorino, Río Guainía, *Maguire & Wurdack 35704* (♂ fl. NY). COLOMBIA. Comisaría del Vaupés: Bajo Vaupés, Mitú y sus alrededores, *Gutierrez V. & Schultes 1021* (♀ fl. A); riberas del Río Inírida (Longit. 69° 45′ W.) sitio "Raudal Alto" o Mariapiri, margen derecha (cerro del varador), *Fernandez 2057* (♂ fl. US), (longit. 70° 30′ W.), alrededores del sitio llamado "Morichal," cerca de la boca del Río Papunáua, *2309* (♀ fl., fr. US).

The nearest relative to judge from a photograph of the type (*Spruce 4226*), seemingly is *Ocotea tarapotana* (Meissner) Mez, placed by Meissner without fruit at hand in the tribe Oreodaphneae. The tri-verticillate branching of the latter species noted in Mez' description is not apparent in the Venezuelan material. Meissner comments on the similarity stating that *O. tarapotana* differs consistently in that the "costae" (obviously he means the lateral nerves) are ascending, not spreading. See also *Endlicheria gracilis* for further discussion.

Ocotea aff. **fasciculata** (Nees) Mez, Jahrb. Bot. Gart. Berlin **5**: 248. 1889.

Oreodaphne fasciculata Nees, Linnaea **21**: 521. 1848.
Mespilodaphne fasciculata (Nees) Meissner in DC. Prodr. **15**^{1}: 108. 1864.

Type. Im Brittischen Guiana am Ufer des Flusses Rupununi, *Rich. Schomburgk 1286* (holotype, fl.).

Vernacular Name. Canau-yek (Steyermark).

Distribution. Reported by Mez to be a small tree with hermaphrodite flowers, occurring in Venezuela (a Karsten collection, probably from Colonia Tovar, near Caracas), in British Guiana, and generally throughout Brazil. VENEZUELA. Bolívar: tree 50 ft, leaves firmly membranaceous-chartaceous, deep green above and shining, dull green below, flowers greenish-yellow, wood slightly fragrant as are the leaves, wooded slopes of Quebrada O-paru-má between Santa Teresita de Kavanayén and Río Pacairao, tributary of the Río Mouak), 1065–1220 m, 20–21 Nov 1944, *Steyermark 60381* (♂ fl. F).

I have not seen the type material of this species, but *Schomburgk 925* (♀ fl. NY) and *Spruce* [*Ocotea* (*3*) (898) (fr. NY)] collected in the vicinity of Santarém, Pará, Brazil; both numbers from the Meissner Herbarium cited by Meissner were available for study.

The Steyermark number was collected from a tree larger than Mez reported, which is definitely dioecious. The wood and leaves are slightly fragrant, a fact not noted for *O. fasciculata*. The species may be new, but until additional specimens from the Guianas are examined for comparison, the number is tentatively placed here.

Ocotea revoluta Moldenke in Gleason, Bull. Torrey Club **58**: 365. 1931.

Type. Shrub on slopes of the Savanna Hills of Mount Duida, Amazonas, Venezuela, 4400 ft, Aug 1928–Apr 1929, *G. H. H. Tate 821* (holotype, fr. NY).

Distribution. Known only from Cerro Duida, the type locality, Venezuela, this shrub bearing leathery, shining leaves which are ovate-oblong or ovate-lanceolate, 4–7 cm long and 1.5–3.5 cm broad, is occasional on the upper slopes of the mountains. VENEZUELA. Amazonas: occasional on upper slopes of Culebra Peak, above Indian village of Culebra, *Maguire & Maguire, Jr. 29131* (fr. NY); *? Tate 610* (st. NY).

So far collected in only the fruiting stage, but not to be confused with any other known species because of the distinctive leaves which are smooth, leathery, with revolute margins, and the short, stout infructescences bearing fruits subtended by sturdy, somewhat cyathiform cupules.

The placement of the species with certainty at this time is not possible. There is nothing against its inclusion in the genus *Ocotea,* although eventually flowering material will establish this point, as well as its relationship within the genus, to which it will then be definitely assigned.

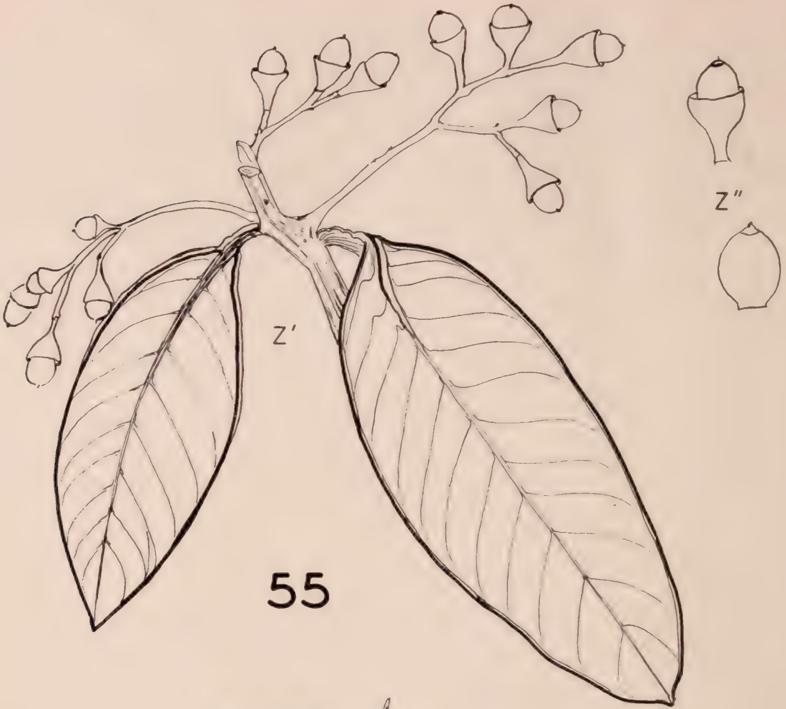
Ocotea perseiphylla C. K. Allen, sp. nov. Fig. 54.

Frutex, gemmis parvis ovoideis griseo-pubescentibus ramulis teretibus juventute dense cupreo-pubescentibus, mox atro-pubescentibus curvo-adscendentibus, foliis plus minusve ad apicem congestis, ramulis floriferis juventute gracilibus. Folia alternata, petiolis satis robustis atro-pubescentibus canaliculatis, ad 12 mm longis et 2–3 mm latis, laminis coriaceis supra glabris, costa ad basim excepta pallida, griseo-virescentibus ± nitidis supra cupreo-sericeis, lanceolato-ellipticis vel leviter oblanceolato-ellipticis, (4–) 7–11.5 cm longis et (1.3–) 2–3.5 cm latis, ad basim acutis, ad apicem acutis vel obtusis, penninerviis, costa supra immersa ad basim pubescenti, subtus elevata, pubescenti, plicata, nervis 4–6-paribus supra obscurissimis subtus gracilibus pubescentibus adscendentibus ad angulo 35° divergentibus, rete venularum non manifesto. Inflorescentia axillaris subterminalisque juventute gracilis, cupreo-sericea ± stricte racemoso-paniculata, 7–9 cm longa, brevipedunculata. Flores hermaphroditi? ante anthesin, ut videtur lobis ovatis extus pubescentibus, staminibus ser I & II subovatis filamentis satis brevibus, ser III antheris subrectangularibus biglandulosis, glandulis antherarum tertiam partem aequantibus subsessilibus, ser IV O; gynoecio glabro, ovario subrotundo quam stylo crasso duplo longiore, stigmate plana obscure triangulari. Infructescentia fructusque ignoti.

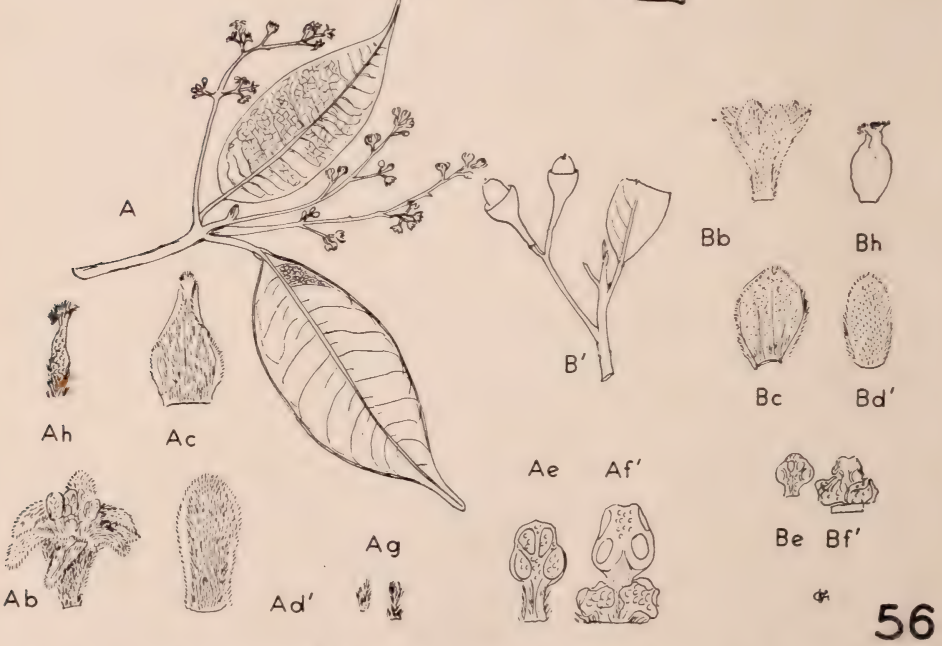
Type. Bush with under leaf-surface rich, copper-pubescent, growing on side of mountain, in vicinity of Cerro Monachi, Río Naquieni, Río Guainía Basin, Comisaría del Vaupés, Colombia, *Richard Evans Schultes & Francisco Lopez 10103* (holotype, fl. US).

Distribution. A striking bush or shrub with the pale, grey-green upper leaf-surface unusually smooth, contrasting with the coppery, sericeous lower surface, known only from the type locality and collection.

I am at a loss to place the species accurately, because of the lack of mature flowering as well as fruiting material. In general appearance it is similar to *O. celiana,* but is easily distinguished by the smaller, sub-bullate, caudate, cordate, narrowly ovate leaves of the latter, backed by a coppery-brown tomentum rather than sericeous pubescence of a bright copper color. There is a marked similarity



55



56

FIG. 55. *Ocotea laticostata* (*Maguire, Cowan & Wurdack 29514*). Z′, habit, fruiting branchlet, × 0.33. Z″, fruits, × 0.5. FIG. 56. *Ocotea yutajensis* (A–Ah, *Maguire & Maguire, 35396* ♂; Bb–Bh; B′, *35188* ♀). A, habit, flowering branchlet, × 0.5. Ab, flower, × 5. Ac, tepal, ser I, ventral, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Ag, staminodium, ser IV, × 10. Ah, aborted ovary, × 10. Bb, flower, × 5. Bc, tepal, ser I, ventral, × 10. Bd′, tepal, ser II, dorsal, × 10. Be, sterile stamen, ser I & II, ventral, × 10. Bf′, sterile stamen, ser III, dorsal, × 10. Bh, ovary, × 10. B′, habit, fruiting branchlet, × 0.5.

in the leaves of *O. perseiphylla* to those found in some members of the genus *Persea,* hence the name.

Ocotea laticostata C. K. Allen, sp. nov. Fig. 55.

Arbor ad 10 m alta, gemmis ut videtur robustis olivaceo-pubescentibus ± obtusis, ramulis robustis valde angulatis minute adpresseque brunneo-pubescentibus aliquantum ''zig-zag.'' Folia alternata, ut videtur reflexa, petiolis robustis minute adpresseque brunneo-pubescentibus glabrescentibus valde canaliculatis, conspicue undulato-alatis, ad 15 mm longis et 4–5 mm latis, laminis utrinque glabris, supra ad basim costa et subtus ad basim costa venisque exceptis, percoriaceis, supra olivaceo-viridescentibus subtus magis brunneis, margine praecipue ad basim recurvatis et petiolo undulato-decurrenti, ellipticis vel ovato-ellipticis, 23–25 cm longis et 9–11.5 cm latis, ad basim rotundatis ad apicem obtusis vel abrupte acutis, penninerviis, costa supra plana subtus valde elevata, ad basim 4 mm lata, nervis plerumque 8–9-paribus supra obscuris subtus elevatis adscendenti-arcuatis, ad angulo 45° divergentibus, rete venularum supra inconspicuo subtus minuto obscuroque. Infructescentia axillaris et subterminalis, robusta, leviter brunnescens, glabrescens, plus minusve stricte paniculata, ad 17 cm longa, rhachidibus valde striatis. Fructus ut videtur immaturus, in sicco olivaceus, ellipsoideus, apiculatus, ad 10 × 8 mm, cupula cyathiformi 7–10 mm longa, 10 mm diam., et 5 mm alt., margine ± plana vel saepe obscure minuteque denticulata, subsessili vel pedicello leviter obconico subtenta. Inflorescentia et flores ignoti.

Type. Tree 10 m, stems angled, leaves coriaceous, in Camp Culebra above Indian village of Culebra, Cerro Duida, Amazonas, Venezuela, 1000–1100 m, 18 Nov 1950, *Bassett Maguire, R. S. Cowan & John J. Wurdack 29514* (holotype, fr. NY).

A species seemingly belonging to *Ocotea,* but the relationship within the genus is uncertain without flowering material. The species may be myrmecophyllous.

Distribution. Known only from the type.

Ocotea or **Nectandra** sp.

Tree 60 ft tall, leaves coriaceous, deep green above, paler green below with rose-red midrib frequently colored, rachis coral-red, fruiting calyx coral-red, verrucose, 9 mm in diam., fruit broadly oblong, becoming blackish, up to 1.5 cm long and 1.5 broad, between Bluff Camp and low promontory north of Bluff Camp, along west-facing portion of Chimantá-tepuí (Torono-tepuí), Bolívar, Venezuela, 1600–1700 m, 5 Jan 1953, *Steyermark 75686* (fr. NY).

Ocotea or **Nectandra** sp.

Arbol de 30 m de alto, esbelto, elegante, copa redonda piramidal, madera amarillo grisacea, hojas pequeñas, frutos pequeños, selva pluvial o sabana natural, region de los riós, Icabarú, Hacha y Cordillera sin nombre a 280° de las cabeceras de Río Hacha, Bolívar, Venezuela, 450–850 m, 2 Jan 1956, *Bernardi 2745* (y. fr., fr. NY).

The above numbers are in fruit only. Though they are obviously not conspecific, both may belong to the *Ocotea cuprea-oblonga* complex. Without flowering material, however, they cannot be placed with certainty to genus or species.

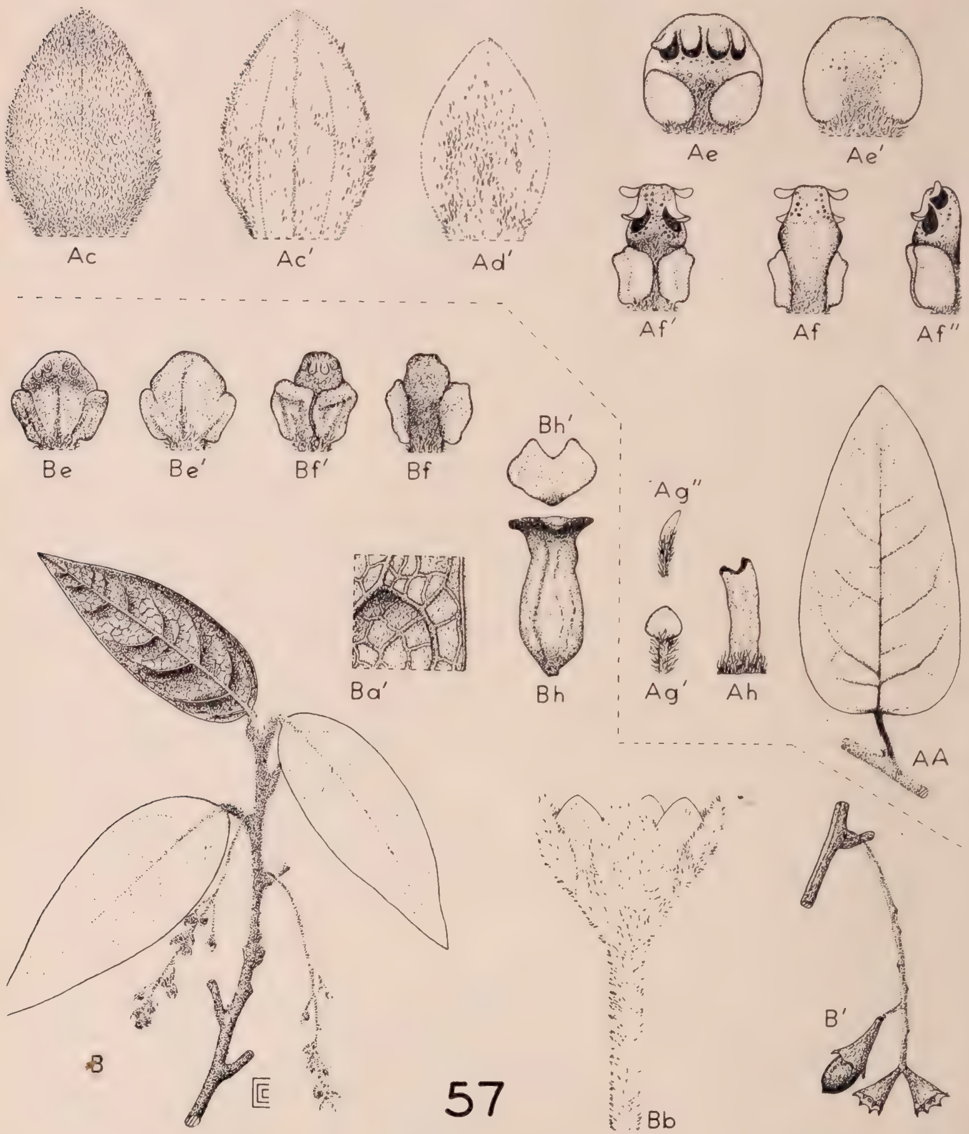


FIG. 57. *Ocotea celiana.* (A–Ah, *Maguire & Maguire 35450* ♂; B–Ba, Bf, Bf′, B′, *35340* ♀; Bb, *35320* ♀; Be, Be′ Bh, *35290* ♀). AA, leaf, × 0.5. Ac, tepal, ser I, ventral, × 10. Ac′, tepal, ser I, dorsal, × 10. Ad′, tepal, ser II, dorsal, × 10. Ae, stamen, ser I & II, ventral, × 10. Ae′, stamen, ser I & II, dorsal, × 10. Af, stamen, ser III, ventral, × 10. Af′, stamen, ser III, dorsal, × 10. Af″, stamen, ser III, lateral, × 10. Ag′, staminodium, ser IV, dorsal, × 10. Ag″, staminodium, ser IV, lateral, × 10. Ah, aborted ovary, × 10. B, habit, ♀ flowering branchlet, × 0.5. Ba′, leaf undersurface, × 3. Bb, flower, × 5. Be, stamen, ser I & II, ventral, × 10. Be′, stamen, ser I & II, dorsal, × 10. Bf, stamen, ser III, ventral, Bf′, stamen, ser III, dorsal, × 10. Bh, ovary, × 10. Bh′, stigmatic surface, × 10. B′, fruiting branchlet, × 0.5.

Nectandra

Since delimitation of this genus has been the focal point of much discussion for the past century, it seems appropriate at this time, before treating the species involved in the area here under consideration, to mention briefly two of the most controversial species complexes concerned. The first centers about *Nectandra cuspidata* and *N. pichurim;* the second about *Nectandra globosa* and *N. pisi.* At present, only tentative suggestions can be made which we can only hope to have clarified when conscientious effort has been made to obtain collections of fruiting material from the areas where these species grow profusely and from which collections have so far been made almost entirely in the flowering stage.

First, the *cuspidata-pichurim* complex. After examination of as much of the type material and collections from the type localities as are available, with close attention to field notes and published comments, the following suggestions are offered. Except for the fact that there are a few scattered fruiting specimens extant, even a distribution pattern and separation as tentative as the following could scarcely be presented. It goes without saying that further collections from the critical areas under consideration will undoubtedly necessitate a change in the present interpretation of the distribution of the species, as well as of the current delimitations of species and genus.

There appear to be two species, at least, similar in branching and leaf habit, which share a common flower structure, namely, having stamens of the first and second series with anthers broader than long, their cells in the arcuate arrangement usual for *Nectandra* and occupying almost entirely the anther structure, with little or no connective tissue apparent. Also, specimens with seemingly identical branching and foliage habits are known to mature two types of fruit, not distinctive in shape, but in their relation to the cupule subtending them, and in the shape of the cupule itself. These, from study of available fruiting material, are represented by *N. cuspidata* and *N. pichurim,* both occurring in the Guayana area; these are discussed below.

Brief mention only should be made here of two additional species closely related to the above-mentioned critical taxa: *Nectandra membranacea* Grisebach from the West Indies exclusive of Trinidad and Tobago, which bears globose, totally exserted fruits subtended by a very shallow, disklike cupule, seated on a much more coarsely enlarged obconical pedicel than that found in the *cuspidata-pichurim* species; and *Nectandra gentlei* Lundell chiefly of Central America, more closely allied with the current concept of *N. cuspidata* than any of the plants under discussion. *Nectandra gentlei* bears ellipsoid fruits, larger than those found in the three taxa last mentioned, and borne totally exserted on shallow cupules. Leaf characteristics of all four species may vary, but the flower structures remain more or less consistent with only minor deviations apparent.

Apparently associated with the *Nectandra cuspidata-pichurim* complex through leaf and branching habit, specimens have been collected from regions of tropical South America other than the Guayana area that show a second type of flower considered to be representative of the *Nectandra globosa-pisi* complex. The typical, more or less triangular, exceedingly fleshy, usually papillose anthers have a protruding connective of varying length. These specimens are mentioned in this connection merely to bring attention to a second type of floral characteristic which in other features has an affinity to the complex discussed above.

The second critical group indicated, the *Nectandra globosa-pisi* complex, will be taken up only briefly in proper sequence, no attempt being made at present to resolve it. Until a thorough monographic study is under way, neither of these areas of the genus can be satisfactorily clarified. Needless to say, such a treatment will necessarily involve a concerted effort on the part of field workers to re-collect in critical type localities both flowering and fruiting materials, preferably from marked trees. This work has already been outlined and it is hoped may be continued. It goes without saying that since intermediate stages of floral structure occur, a study of *Nectandra* must involve a concomitant treatment of the genus *Ocotea* as well and the ''fringe'' genus, *Pleurothyrium,* the latter heretofore thought to be restricted to the Amazonian area, but which perhaps may be far more widely distributed. Then and only then can a re-evaluation of generic delimitation be undertaken with hope of a satisfactory and acceptable conclusion. The following discussions and descriptions must rest on the study of the inadequate materials currently available in herbaria.

Nectandra cuspidata Nees & Martius in Nees, Syst. Laurin. 330. 1836.

Types. In ripa Fluminis Amazonum, praesertim ad villam Ega Provinciae Fluminis nigri Brasilae, et in sylvis Japurensibus eiusdem Provinciae, Ianuario mense ichoante anthesi et cum fructu maturo; porro in sylvis secus fluvios Maué et Amazonum Provinciae Paraënsis et Fluminis nigri, Septembre cum floribus fructibusque, *Martius* (syntypes, fl., fr. M); ad Ega iuxta flumen Amazonum, *Poeppig* (syntype).

Vernacular Names. Guada-yek (Bernardi); Laurel (common).

Distribution. Tree probably occurring very widely from Trinidad and Tobago along the lower coastal areas of the Guianas, Venezuela and northern Brazil, from Pará westward to the lower Río Orinoco and Rio Solimoes Basins in Amazonas, south to Paraguay; and occasionally in the Guayana Highland area of Bolívar and Amazonas, Venezuela and adjoining Colombia. VENEZUELA. Bolívar: Kussarivará (El León) formaciones secundarias, Urimán, *Bernardi 1631* (fl. NY); Amazonas: terrenos arenosos y húmidos a orillas del Río Orinoco en los alrededores de San Fernando, *Molina & Barkley 18 V 174* (fl., y. fr. US); occasional in Sabana Huachapana, left bank of river 30 km above mouth of Río Ventuari, *Maguire, Wurdack & Keith 41469* (fl. NY), along river just below Raudal Gallineta, Río Siapa, *Wurdack & Adderley 43578* (fl. NY). COLOMBIA. Comisaría del Vaupés: en suelos arenosos y selvas densas, region de San Felipe a orillas del Río Guainía, *Molina & Barkley 18 Va 003* (fr. US); Intendencia del Meta: dense, humid forest, El Mico Airstrip (Camp 1), *Philipson, Idrobo & Fernandez 1397* (fl. BM).

Nectandra cuspidata, described from the Rio Negro and Rio Solimoes regions, with a variety *macrocarpa* from Rio de Janeiro (which may be only a mature fruiting specimen) may bear ellipsoid or globose fruits, always totally exserted and subtended by a shallow, flaring cupule.

The specimens collected by Maguire, Wurdack & Keith and by Wurdack & Adderley are quite similar in every respect, both showing long, narrowly lanceolate leaves with attenuate, tapering tips and numerous, full-flowered inflorescences. The Colombian material bears smaller leaves and fewer, few-flowered inflorescences.

Nectandra pichurim (H. B. K.) Mez, Jahrb. Bot. Gart. Berlin **5**: 449. 1889.

Ocotea pichurim H. B. K. Nov. Gen. Sp. **2**: 132. 1817.

Type. Crescit in uliginosis iuxta Caño de Berita, prope Calabozo, Venezuela fructificat Martio, Laurel incolarum, *Humboldt* (holotype, fl. P).

Distribution. Tree found in regions of Colombia adjoining the type locality, south in Peru, Bolivia, and Argentina, and in the sandstone areas of British Guiana and Bolívar and Amazonas, Venezuela. VENEZUELA. Bolívar: bank of Río Tonoro, Alt. Río Paragua, *Cardona 820* (fl. NY, US); Amazonas: in light forests, Laguna de la Culebra, near San Carlos, Cojedes, *Pittier 7740* (fr. F), *11712* (fr. NY).

Nectandra pichurim, based on the Humboldt collection from Calabozo, south of Caracas, Venezuela, is described as bearing fruit of the size and shape of an olive, subtended by a glabrous, coriaceous cupule with entire rim. The hemispheric cupule, actually cyathiform, covers the fruit for about one-third its length, as noted on specimens collected near the area of the type locality and in adjacent Colombia.

Nectandra grandis (Mez) Kostermans, Meded. Bot. Mus. Utrecht **25**: 17. 1936, non Nees.

Endlicheria ? grandis Mez, Jahrb. Bot. Gart. Berlin **5**: 124. 1889.

Nectandra praeclara Sandwith, Kew Bull. **1932**: 224. 1932. *Sandwith 387,* (holotype, ♂ fl. K; isotype, NY).

Type. Ad fl. Maroni, French Guiana, *Melinon s.n.* (holotype, fr.)

Vernacular Names. Shirua (Sandwith); Canau-yek, Canau-haure (Steyermark).

Distribution. A tree with polygamo-dioecious(?) flowers known from the Guianas and the region of Roraima and neighboring mountains of Bolívar, Venezuela. VENEZUELA. Bolívar: lower portion of wooded slopes of Quebrada O-paru-má, between Santa Teresita de Kavanayén and Río Pacairao (tributary of Río Mouak), *Steyermark 60403* (fl. F), Mount Roraima, southwest-facing forested slopes between Rondon Camp and base of sandstone bluffs, *59001* (fl. F).

Seemingly a very unstable species, the flowers of which bear stamens with anthers usually typical of *Nectandra* in structure, occasionally varying from the norm sufficiently to raise the question of its inclusion in the genus. Mez had no flowers to guide him in his disposition of Melinon's collection. The type of Sandwith's species bears variable flowers. The two I examined differed from each other; one was a staminate flower with typical *Nectandra* stamens and aborted ovary, agreeing with the original description; the other, a pistillate flower in the post-anthesis stage with narrower, sterile anthers apparently with only two locules. It has been noted elsewhere that flowers in the post-anthesis stage often show changes particularly in the staminal cycles, thought to be due to desiccation and pressure exerted by the developing fruit. The Venezuelan numbers, though variable in leaf-size and shape, appear to belong with this taxon. At best, the species is one of the few apparently on the border line between *Nectandra* and *Ocotea,* having structures and habits typical of both.

Nectandra cymbarum (H. B. K.) Nees, Syst. Laurin. 305. 1836. Mez, Jahrb. Bot. Gart. Berlin **5**: 465. 1889. Fig. 58.

Ocotea cymbarum H. B. K. Nov. Gen. Sp. **2**: 132. 1817 [holotype, (non Poeppig ex Nees; non Sprengel ex Nees.) *Humboldt*].

Licaria cymbarum Pittier, Bol. Soc. Venez. Ci. Nat. **7**: 135. 1941.

Nectandra elaiophora Barbosa Rodriguez, Vellozia (1866–1888) ed 2. 64, 65. *pl. 18.* 1891 (holotype); emend. Ducke, Arch. Jard. Bot. Rio de Janeiro **4**: 113, 114, *f. 8.* 1930. (*Ducke 19956,* lectotype, fl. NY).

Type. Crescit in sylvis Orinocensibus prope San Fernando de Atabápo, Amazonas, Venezuela, *Humboldt & Bonpland* [*904*] (holotype, fr. P).

Vernacular Names. Louro inamuy (Ducke); Louro mamory (Froes); Sassafras (Ducke); Sasafras (Williams).

Distribution. Large tree along periodically flooded river banks of the Amazon Basin, chiefly the Río Orinoco, Rio Negro and their tributaries. BRAZIL. Amazonas: Fonte Bôa, *Froes 20667* (fr. NY); Cucuhy, ad ripas inundatas Rio Negro, *Ducke 38* (fl. NY), Paraná do Limão, Rio Negro inferior, *23963* (fr. US). VENEZUELA. Amazonas: occasional along Río Casiquiare just below Capihuara, *Wurdack & Adderley 43639* (fl. NY); Río Orinoco between mouth of Río Atabápo and Caño Masagua, 10 km upstream, *Level 92* (fl. NY); en selva rebalsera, Boca del Caño Tamatama, Orinoco, *Williams 15860* (fr. A, F, US); Bolívar: Temblador, Medio Caura, *Williams 11686* (fr. F, US). COLOMBIA. Comisaría del Vaupés: riberas del Río Papunáua, cinco kilometros arriba de su desembocadura en el Inírida, *Fernandez 2325* (fr. US), riberas del Río Inírida, alrededores del sitio llamado ''Morichal,'' cerca de la boca del Río Papunáua, *2034* (fr. US).

The leaves of the cited specimens are usually thinly membranaceous, sometimes in the fruiting stage becoming subcoriaceous; the venation is more or less inconspicuous except for the midrib, which is generally brownish in contrast to the pale green of the blade in the dried state. The leaves, however, vary in size and shape, the smaller being more broadly elliptic than the narrowly elliptic or sublanceolate-elliptic larger ones.

Ducke's emended description of Barbosa Rodriguez' species includes an illustration showing flowers and a fruit obviously copied from the plate of the original publication.

The notable lack of flowering material in comparison with fruiting collections—a universal complaint of students of the Lauraceae—is mentioned by Ducke as being due to the great height of trees in the area of his study and to the fact that the flowering season coincides with the period of greatest inundation along the rivers. Particularly interesting is the presence in the trunks of older trees of ''vegetable gas,'' an ''excessively clear, transparent, aqueous, highly aromatic oil with an odor of turpentine.'' This is used locally, according to collectors, for illumination and for medicine as well.

The much-discussed ''N. cymbarum,'' known only from fruiting specimens collected originally at San Fernando de Atabápo, is placed here at this time without hesitation, though future collections of flowering material from the region may reveal differences not now noted. The ''cymbarum'' fruits are not to be distinguished from that illustrated by Barbosa Rodriguez, and the notes of several subsequent collectors also record the presence of oil with a turpentine-like odor. The apparent double margin of the cupule in all of the specimens cited above, including the fruits collected by Ducke after the publication of the species, although an outstanding characteristic of the genus *Licaria*, is found in several species that belong indisputably to *Ocotea*. As far as is known at present, this is its only recorded occurrence in *Nectandra*.

Near this species, if indeed not a variation of it, is *Steyermark 56739* (fl. F), collected in Mérida, Venezuela, along the Río Onia near Bolero, north of Mesa Bolívar. The leaves are definitely coriaceous, but the flower-structure is identical with that of the Amazon plants; the collector notes ''strong turpentine-smelling heart wood from which oil is extracted for medicine.''

The Fernandez numbers cited more nearly approach Mez' interpretation of the species, as indicated by his inclusion of Martius' collection from ''Alto

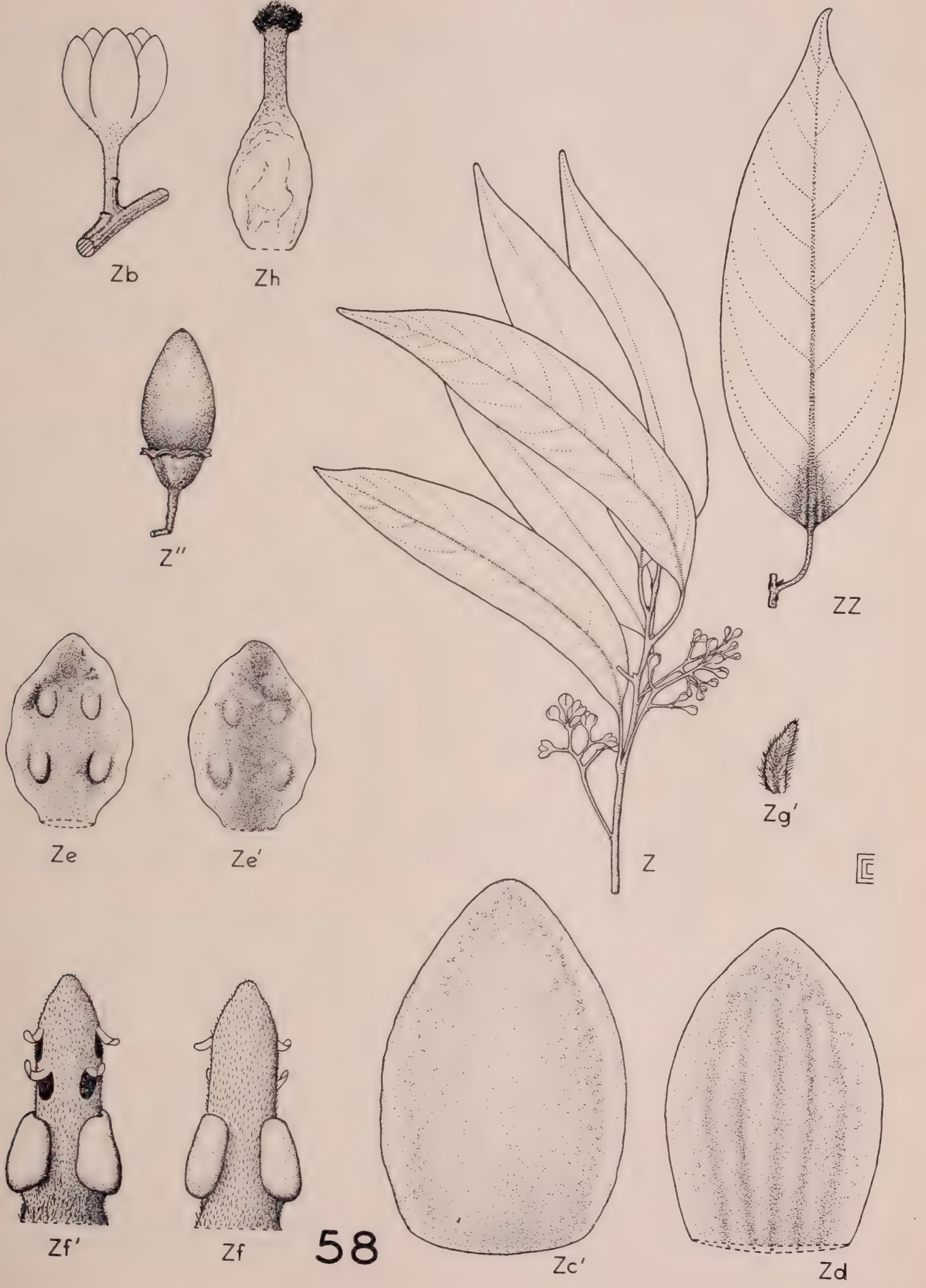


FIG. 58. *Nectandra cymbarum* (Z, Zb–Zh, *Wurdack & Adderley 43639;* ZZ, *Williams 15860, US;* Z″, *Williams 11686, US*). Z, habit, flowering branchlet, × 0.5. ZZ, leaf from fruiting branch, × 0.5. Zb, flower, × 2.5. Zc′, tepal, ser I, dorsal, × 10. Zd, tepal, ser II, ventral, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze′, stamen, ser I & II, dorsal, × 10. Zf, stamen, ser III, ventral, × 10. Zf′, stamen, ser III, dorsal, × 10. Zg′, staminodium, ser IV, dorsal, × 10. Zh, ovary, × 10. Z″, fruit, × 0.5.

Amazonas'' and illustrated in the latter's publication.[20] The fruit-cupules, except for the proximity of the two margins, strongly resemble those of Martius' illustration. This characteristic of the cupules has not always proved reliable, however. A close examination of more mature fruits of *Williams 11686* shows that the outer rim of some cupules has been broken, giving the appearance of greater proximity of the two margins. Possibly the *Nectandra cymbarum* of Martius' illustration represents a different phase of development under a variant situation. Certainly the leaves and branchlets show no significant differences. The vernacular name ''Sasafras'' appears on the Fernandez label, but no mention is made of the uses of the tree. Possibly Martius' plant may represent the fruiting stage of *N. urophylla* Meissner, based on *Spruce 222,* (*Nect. 2*) (fl.) collected at Santarém. Subsequent collections may shed light on this rather baffling problem.

Nectandra guianensis Meissner in DC. Prodr. **15^1** : 160. 1864.

Nectandra salicifolia Nees, Linnaea **21**: 506. 1848 (ex parte, non Syst. Laurin; syntype, *Schomburgk 858,* isotype, fl. NY).

Nectandra salicifolia var. *β* Nees, Linnaea **21**: 507. 1848; isotype, *Hostmann 973,* st. NY).

Vernacular Name. Shirua (Brit. Guiana).

Distribution. Shrub or small tree of British Guiana and Suriname extending into the Río Caroní area of Bolívar, Venezuela, south to the border between Brazil and Venezuela up to 750 m. VENEZUELA. Bolívar: selvas de Guairampai, *Lasser 1374* (fl. NY, US) ; occasional at woodland edge near Fazenda Natal, 10–12 km northeast of Fazenda Vista Geral, frontier between Territorio do Rio Branco, Brazil and Estado Bolívar, Cerro do Sol, *Maguire & Maguire 40248* (y. fr. NY). BRITISH GUIANA. From part secondary Maximiliana marsh forest, Powis Creek, Courantyne River, *For. Dept. British Guiana 5399* (*Field No. 2611*) (fl., fr. NY).

Of the paratypes cited by Meissner, the following only were available: *Schomburgk 549* (fl. NY), from Roraima, British Guiana, and *Hostmann & Kappler 579* (st. NY). The numbers I have cited agree with the paratypes and with the only syntype available for study at present.

Superficially, this species has the aspect of *N. cymbarum,* but the leaves differ in the type of venation; the much smaller flowers bear very broad anthers without attenuated connectives; and the smaller fruits are subtended by cupules more typical of the genus *Nectandra* as it has generally been recognized.

Nectandra pisi Miquel, Stirp. Surinam. 199. *pl. 60.* 1851.

Nectandra globosa Mez, Jahrb. Bot. Gart. Berlin **5**: 415. 1889. (non *Laurus globosa* Aublet).

Nectandra globosa var. *barbeyana* Mez, Jahrb. Bot. Gart. Berlin **5**: 416. 1889. (syntype, *Blanchet 1863,* isotype, fl. NY.)

Nectandra pallida Miquel, Stirp. Surinam. 196, *pl. 59A.* 1736. (holotype, *Kappler 1827,* fl. U.)

Nectandra vaga Meissner in DC. Prodr. **15^1**: 153. 1864. (syntypes, *Schomburgk 896, Sagot 811,* fls. NY.)

Nectandra leucantha Miquel, Stirp. Surinam. 196. *pl. 58.* 1851.

Type. Arboream floribus albis fructque onustam, ad ripam fluminibus prope Bergendaal, Suriname, m. Majo, *Focke* (holotype, fl., fr.).

Vernacular Names. Canau (Cardona) ; Canau-yek, Tabau-yek (Steyermark).

---

[20] Flora Brasiliensis **5^2**: 265. *pl. 96.* 1866.

Distribution. Tree of varying height small, medium or large (60 m), bearing panicles of widely differing size and shape consisting of few to many white flowers, generally from the Guianas westward in Venezuela at low altitudes with a few collections known from Bolívar and Amazonas in Venezuela in the sandstone area up to 1220 m, and westward to the Macarenes of Colombia; also in northern Venezuela and adjoining Colombia, and south into Bolivia. VENEZUELA. Bolívar: wooded ravine below edge of mesa escarpment between Santa Teresita de Kavanayén and wooded quebrada about 8 km northwest of Kavanayén, *Steyermark 60471* (fl. F), along Río Karuai, at base of Sororopán-tepuí, west of La Laja, *60792* (fl. F); selva pluvial climax, al SE de Santa Elena, *Bernardi 6754* (y. fr. NY); selvas el Río Uonán, afluente del Ikabarú, Caroní, *Cardona 1699* (fl. US), bosques del Río Ictebe, *2181* (fl. US), bosques del Río Ikabarú, *2194* (fl. US); en el margen del Caura, Temblador, *Williams 11612* (fl. F); Amazonas: in mixed forest near Base Camp, Cerro Sipapo (Paráque), *Maguire & Politi 28001* (fr. NY); Río Orinoco, 1–10 km below San Fernando de Atabápo, *Level 65* (fl. NY); along Río Orinoco just below mouth of Río Atabápo, *Wurdack & Adderley 42798* (fl. NY), along river just above Tama-Tama, *43127* (fl. NY), occasional along Yavita-Pimichín Trail, near Yavita, Río Atabápo, *42902* (fl. NY), occasional along Río Siapa between mouth and Caño Manapiare, *43489* (fl. NY); Río Vasiva, tributary of Río Casiquiare, *Cardona 1492* (fr. US). COLOMBIA. Intendencia del Meta: dense forest on bank of Río Guapaya, Sierra de la Macarena, *Philipson, Idrobo & Fernandez 1624* (fl. NY), and Caño Entrada, *1918*, (fl. NY); Comisaría del Vaupés—Intendencia del Meta: Río Guaviare, San José del Guaviare, margen río, *Cuatrecasas 7458* (fl. F).

This widespread and variable species is constant in bearing branchlets that for the most part maintain minute, appressed, fulvous pubescence through the flowering stage, becoming sparingly pubescent in fruit; and inflorescences with large flowers which have triangular, usually papillose anthers with a fleshy connective, the cells in an arclike formation in the lower portion. The inflorescences are usually shorter than the leaves and may be few- to many-flowered, often more or less corymbose. The oblong, ovoid, or subglobose ovary is usually equal in length to the style, and the fruit is ellipsoid. Few fruiting specimens are available.

The material which I have seen from British Guiana, representing the typical *N. pisi* Miquel vegetatively, is consistent in having fulvous pubescence on branchlets and inflorescences. The flowers are densely pubescent without, the stamens with densely papillose, fleshy anthers; those of series I and II are broadly or triangularly ovate with rounded or slightly obtusely subacuminate tips; those of series III are short and obovate or obovate-truncate; and the ovary is usually subglobose, occasionally ovoid, and usually equals the style. These characteristics accord very well with *Schomburgk 896* and *Sagot 811,* syntypes of *N. vaga β vulgaris* and *γ major* of Meissner, which I have seen. *Blanchet 1544bis,* and *1863,* holotype of *N. globosa* var. *barbeyana* Mez; both represent *N. pisi.*

I have not examined Miquel's type of *N. pisi,* based on Focke's specimen, but the illustration is not in conflict with the inclusion of the numbers cited by Mez, excluding his reference to Aublet's *Laurus globosa* for which no specimen is mentioned.

The Macarena specimens cited show leaves with 8 or 9 pairs of veins, glabrescent, reddish-brown, angular branchlets, and slightly smaller flowers with the structure typical of the species. Material from Vaupés (*Cuatrecasas 7458*) and some numbers from northern Colombia not here cited, also show leaves with this number of veins, but the stamens of series I and II consistently have long-triangular-ovate anthers, while those of series III are broader and less attenuate at the apex.

Nectandra leucantha of Bentham, cited by Mez under *N. globosa,* based on *Spruce 3677*, which is at hand, differs only slightly from the Guiana materials examined. The leaves tend to be more rounded at the base with much more regular venation, the latter calling to mind *N. caucana* of Colombia, a species with yellowish-pubescent branchlets and leaves with 12 or more pairs of veins. The inflorescences of *Spruce 3677* and the collections of *N. pisi* from Amazonas, Venezuela, above cited, are usually very full-flowered and often more corymbose, but a similar internal structure of the flowers prevails. These variations appear, from the rather sparse material available, to be more or less consistent within the sandstone area of this part of Venezuela.

Nectandra ambigua Meissner (in DC. Prodr. **15**^{1}: 158. 1864), based on *Schomburgk 29* (isotype, fl. US), is very near the specimens representing *N. pisi,* except for the opposite, 5 or 6 nerved leaves; the anthers, however, are long-ovate or triangular-ovate, and the ovary, if globose, nearly equals the style.

Nectandra lucida Nees, the type of which was collected by Martius near the Japura River in upper Amazonia, I have not seen, but *Schomburgk 568*, cited by Mez, is at hand. This is similar to *N. ambigua* in flower as well as leaf-shape and venation, but the branchlets and inflorescences tend to be more glabrescent, and the leaves are alternate instead of opposite. Several collections by Krukoff from the Rio Acre and Rio Embira regions of Brazil have been referred to *N. lucida,* but the veins of these numbers are consistently 8 or 9 pairs.

The *Nectandra globosa* based on Aublet's *Laurus globosa* (Pl. Guiane **1**: 364. 1775) supposedly has globose fruit. I have seen no specimens belonging to the *pisi*-complex, collected in the area we are considering, with this type of fruit.

It is of interest to note that except for minutely pubescent red-brown, angular branchlets, the collection of *Wurdack & Monachino 39722* (fl. NY) from Serranía Imataca, Territorio Delta Amacuro, is very like the description of *N. pallida* Miquel, the type of which I have not seen.

Wurdack & Guppy 158 (fl. NY), from Hato La Vergareña, varies from the Bolívar and Guiana collections in having more regularly lanceolate-elliptic leaves, and fewer, stricter, racemose inflorescences not branching at the tip as do the other specimens from this general region of Venezuela.

From the above comments, it is obvious that the species is not a stable one, to say the least, and undoubtedly needs much more critical study. It is obvious, also, that a definitive treatment must be delayed until such time as more abundant fruiting material is available from all of the regions now represented in our herbaria by only flowering material.

Nectandra rubra (Mez) C. K. Allen, comb. nov.

Ocotea rubra Mez, Jahrb. Bot. Gart. Berlin **5**: 258. 1889.

Type. French Guiana, *Melinon s.n.* (isotype, fr. NY).

Vernacular Names. Mana-choro-yek, Pachira-yu-yek, ''Caobilla'' Spanish (Steyermark).

Distribution. A large tree to over 100 ft tall, and, according to Mez, a shrub as well, reportedly used locally for construction, occurring from the Guianas to Pará and Maranhão, Brazil and in the sandstone area of Bolívar, Venezuela, up to 1600 m. Mez has doubtfully reported it from Trinidad, basing the report on a sterile specimen which I have not seen. VENEZUELA. Bolívar: SE of campamento 125 between campamento 125 to beginning of dwarfed forest above bluffs above waterfall, on NW slopes of Cerro Venamo, *Steyermark & Nilsson 136* (fr. NY); southeast-facing slopes of Ptari-tepuí, *Steyermark 59998* (fl. F), vicinity of Santa Teresita de Kavanayén, *60921* (fl. F).

From the flowering material at hand, I see no reason for this species to be excluded from *Nectandra*. It is one of the easier taxa to be distinguished because of the thick, obovate leaves in the dried state, green-brown and often shining above, brown beneath, clustered at the tips of exceedingly robust branchlets.

Pleurothyrium panurense (Meissner) Mez. Jahrb. Bot. Gart. Berlin **5**: 468. 1889.

Nectandra panurense Meissner in DC. Prodr. 15^1: 157. 1864.

Type. Prope Panuré ad Rio Uaupés, Amazonas, Brazil, *R. S. Spruce 2449,* Oct 1852–Jan 1853 (isotype, fl. NY).

Vernacular Name. Louro (Froes).

Distribution. Tree or shrub, according to Mez, to 20 m, 35 cm in circumference, occurring sometimes in clay-silicose soil on the banks of ravines along the Rio Negro and tributaries in Amazonas, Brazil. BRAZIL. Amazonas: terreno, argilloso-silicoso, mata, beira decorrego, Jauareté, Vaupés, *Froes 21235* (fl. NY), Manáos, *20526* (fr. NY).

The infructescence and fruit of this species were unknown until the above-cited collection was made. The stout infructescence is glabrescent, and has only a single fruit, black in the dried state, ellipsoid, about 15 × 9 mm, subtended by a cyathiform cupule about 10 mm long and 12 mm in diameter, the margin thin and somewhat erose, the surface rough, with a few large (about 2–3 mm in diameter), pale brown tubercles, seated on an expanded, obconic pedicel 8 mm in length and 5 mm or less wide at the apex.

The dark, reddish-brown pubescent branchlets, the rather shining leaves with stout midribs and 10–12 pairs of nerves impressed above and very prominently, conspicuously elevated beneath are characteristic of the species. Particularly noticeable is the regular pattern made by the confluent nerves near the margin of the leaves, which is frequently characteristic of the genus.

Pleurothyrium cowaniana, C. K. Allen, sp. nov. Fig. 59.

Arbor parva ad 10 m alta, gemmis magnis ovoideis fulvo-tomentosis, ramulis robustis conspicue striatis angulatis teretibus dense fulvo-tomentosis. Folia magna, alternata, petiolis percrassis dense fulvo-tomentosis valde canaliculatis ad 2 cm longis et ad 5 mm latis, ut videtur striatis, laminis supra glabris sublucidis sparse papillosis, subtus sparse pubescentibus glabrescentibus, membranaceis, ellipticis ad 35 cm longis et 14 cm latis, margine subtus utrinque dense pubescentibus, ad basim obtuso-acutis vel subrotundatis, ad apicem abrupte acuminatis, acumine tenui acuto ad 18 mm longo, et ad basim 7 mm lato, penninerviis, costa supra subplana, subtus crassa elevata pubescenti, nervis ± 15-paribus plerumque tenuibus supra leviter impressis subtus elevatis pubescentibus, ad angulo 50–45° divergentibus ad marginem confluentibus, rete venularum utrinque laxo, nervis transversis gracilibus conspicuisque. Inflorescentia axillaris, satis robusta, minute fulvo-tomentosa, racemoso-paniculata, ad 11 cm longa, pedunculo ad 2.5 cm longo. Flores magni, ad 7 mm longi (post anthesin) pedicellis ad 1.5 mm longis, perianthio campanulato vel suburceolato, eburneo-albo fide coll., dense pubescenti, lobis crassis apice reflexis, exterioribus late ovatis, inte-

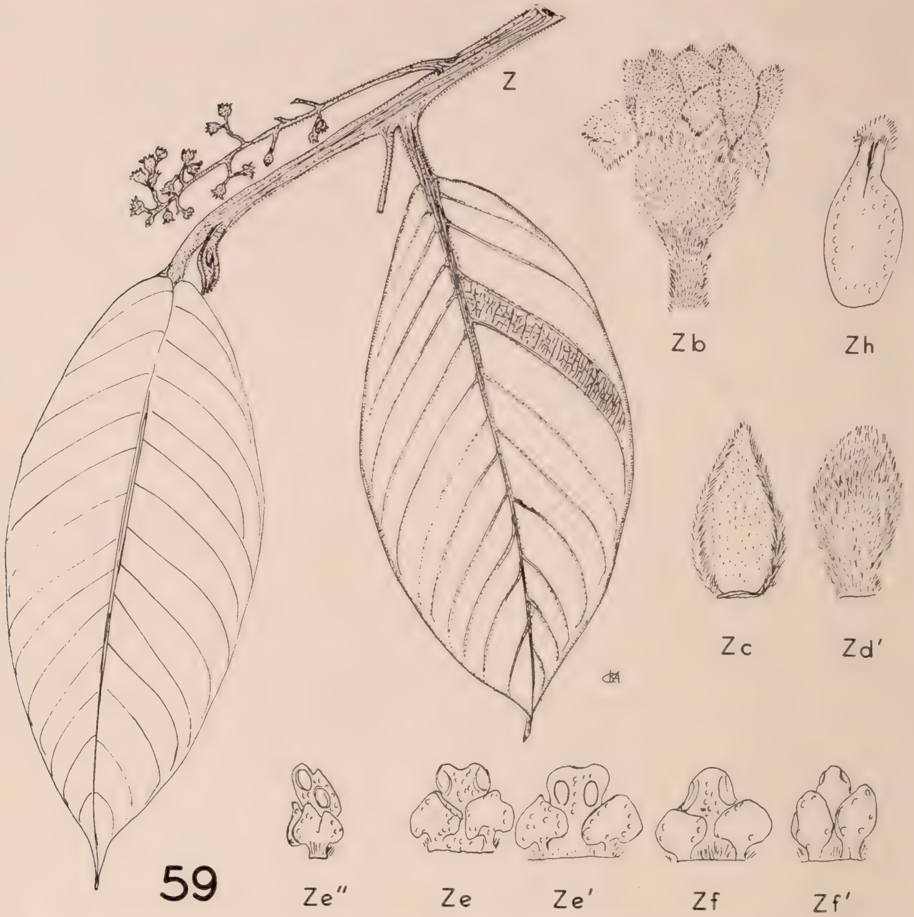


FIG. 59. *Pleurothyrium cowaniana* (*Maguire, Cowan & Wurdack 29830*). Z, habit, flowering branchlet, × 0.5. Zb, flower, × 5. Zc, tepal, ser I, ventral, × 10. Zd', tepal, ser II, dorsal, × 10. Ze, stamen, ser I & II, ventral, × 10. Ze', stamen, ser I & II, dorsal, × 10. Ze", stamen, ser I & II, lateral, × 10. Zf, stamen, ser III, ventral, Zf', stamen, ser III, dorsal, × 10. Zh, ovary, × 10.

rioribus angustioribus, intus papillosis, ad 2.2 mm longis, tubo ad 1.5 mm longo; staminibus pubescentibus, filamentis latis saepe antheris indistinctis, ser I & II ad 1 mm longis, incurvatis, antheris subemarginatis quam filamentis leviter latioribus, locellis superioribus introrsis, inferioribus lateralibus, filamentis biglandulosis, glandulis quam antheris longioribus, saepe stipitatis, gynoecio ellipsoideo glabro ad 2.2 mm longo quam stylo robusto duplo longiore, stigmate magno papilloso subtriangulari. Infructescentia fructusque ignoti.

Type. Small tree to 10 m, flowers cream-white, in montane forest near Intermediate Camp, Cerro Huachamacari, Río Cunucunuma, Amazonas, Venezuela, 1200 m, 4 Dec 1950, *Bassett Maguire, R. S. Cowan & John J. Wurdack 29830* (holotype, fl. NY).

Distribution. Known only from the type locality.

The species resembles somewhat the *Nectandra* described by Dr. T. Lasser from Rancho Grande in northern Venezuela—probably a species of *Pleuro-*

thyrium. It is distinguished, however, by the membranous leaves with fewer, more strictly ascending nerves. The species here reported is unusual in that a rim of dense pubescence visible in some degree on both surfaces clothes the margin of the adult leaf. It represents the second species of the genus to be recognized from the sandstone area of the Guayana Highland.

GUTTIFERAE subfam. MORONOBOIDEAE (American genera)

It has become currently popular, to some extent on nomenclatural considerations, to separate the Hypericaceae from the Guttiferae. Taxonomically this practice seems to be sound, and in these series of papers the hyperics (*Hypericum, Vismia,* etc.) will be so separated.

Also, perhaps chiefly on nomenclatural grounds, the residue of the traditional Guttiferae has often been dumped into the Clusiaceae. While I am confident that the familial name Clusiaceae will have a usefulness as representing a natural taxonomic aggregation, I am not at all sure what should go into it. Therefore, until I am better instructed, I shall use the family designation Guttiferae in the more inclusive and historic sense (except for the Hypericaceae) to hold such diversified groups as *Clusia* and its relatives, *Moronobea, Mammea, Rheedia, Calophyllum,* etc., until they are to be more satisfactorily placed.

The Moronoboideae comprises a small obviously natural assemblage of genera chiefly to be found in the Neotropics. But also it shows a wide American, African and Pacific disjunct distribution. The several genera are associated morphologically (within the Guttiferae) most conspicuously by 1) the aggregation of the stamens in five discrete phalanges, 2) the fruit being indehiscent and baccate, and 3) the seed being comparatively large, few in number and without arilli. The small genus *Pentadesma* is confined to West Africa; the small genus *Montrouziera* is confined to New Caledonia. *Symphonia* is represented by *S. globulifera,* common to the American tropics and tropical Africa, *S. gabonensis* of western equatorial Africa, and, according to Perrier, 16 species in Madagascar, where the genus has apparently become morphologically more diversified.

In the Neotropics there are five genera, one newly proposed in this paper. None of these genera is large. *Symphonia* and *Platonia,* both widespread and plastic, seem to be monotypic. *Thysanostemon* has two apparently closely restricted endemic species. *Lorostemon,* with three species known at this time, is likewise narrowly endemic. *Moronobea,* confined to Guayana and the Amazon Basin, has developed at least the seven species that are accounted for here.

Key to the American Genera of the Moronoboideae

1. Stamens aggregated in 5 discrete phalanges that alternate with the coral, pink or white petals; flower buds ovate, conic or oblong.
  2. Styles distinctly defined, slender, exceeding 1 cm in length, style branches prominent, exceeding 3 mm in length; petals ovate or obovate-orbicular, less than 1/2 longer than broad, pink or white; flower buds ovoid or conic.
    3. Stamens numerous, exceeding 50 per phalange, vertically arranged, aggregated in 4–6 series; ovary not spirally engraved, but with prominent gland-like usually persistent protuberance at base alternating with phalanges. 1. *Platonia.*
    3. Stamens 3–5 per phalange, uniseriate, often spirally twined about ovary; ovary commonly spirally engraved, basal gland-like protuberance usually not persistent after anthesis. 2. *Moronobea.*
  2. Styles lacking or very short and thick, not distinctly defined, style branches 1 mm or less long; petals linear-oblong, more than twice longer than broad, coraline; flower buds oblong.

4. Ovary and fruit conspicuously stipitate; pericarp thick, ligneous or baccate, deeply and coarsely longitudinally ribbed; peduncles 1 cm or less long, conspicuously bracteate. 3. *Lorostemon.*
4. Ovary and fruit sessile; pericarp not ligneous, at maturity thin and chartaceous, smooth, not at all longitudinally ribbed; peduncles much exceeding 1 cm in length, essentially ebracteate. 4. *Thysanostemon.*

1. Stamens aggregated in 5 phalanges, but the filaments connate throughout forming a tube, only the anthers free; anther-groups erect, or at length rotate or reflexed; style elongated, slender, cylindric, the 5 branches prominent and rotate in anthesis; fruit ovate, 1 or 2 seed maturing; flower buds spherical, petals scarlet, not expanding at anthesis. 5. *Symphonia.*

1. **Platonia** Martius, Nov. Gen. et Sp. **3**: 168, tab. 289. 1829.
Platonia insignis Mart. Nov. Gen. et Sp. **3**: 168, tab. 289. 1829.

P. grandiflora Pl. & Tr. Ann. Sci. Nat. IV. **14**: 297. 1860.
P. insignis Mart. var. *formosa* R. E. Schultes, Bot. Mus. Leafl. **17**: 18. 1955.

Type. Pará, Brasil, *Martius 2569* (holotype M, photo NY; isotype M, photo NY).

Distribution. A large tree with yellow latex and handsome pink flowers, widely distributed in the Guianas, the middle and lower Amazon Basin, and the lower Río Negro. The ripe yellow pericarp of the fruit is edible.

P. grandiflora Pl. & Tr. (l.c.), based on a specimen (specimens?) in herb. Mus. Paris marked ''Brésil,'' bearing the ined. designation ''*Symphonia grandiflora* Choisy,'' was distinguished chiefly because of presumed quantitative difference of size of flowers and flower parts.

The var. *formosa* was described as having the petal margins strongly involute. The type has not been available to me.

This fine forest tree is quite variable in the size and form of its leaves, and in the size of its flowers. A review of the materials at Harvard, the U. S. National Herbarium and at New York does not lend evidence of any specific or varietal segregation.

2. **Moronobea** Aublet, Hist. Pl. Guiane Fr. **2**: 789. 1775.

Type species. *M. coccinea* Aubl.

In America, *Moronobea* is the largest genus of the Moronoboideae, and is confined to the Guianas and the basins of the Amazon, Negro and Orinoco Rivers. Its several species, especially *M. coccinea* and *M. riparia*, provide a copious yellow latex, as do *Symphonia* and *Platonia*, that is employed by Indians and local people as a caulking for river boats, an adhesive in instrument fabrication, and a pitch for torch lighting (see Schultes, Bot. Mus. Leafl. **17**: 12–24. 1955).

Engler and following him, Vesque, the last two students to consider the genus in its entirety, gave much taxonomic weight to the number of anthers per phalange. Both of these authors considered the anther number to be sufficiently constant to form the basis of key separation and indeed species delimitation. From the considerably more material that is now available, and especially from the examination of the flowers of many trees by me in the field, it has become clear that the number of anthers per phalange is variable, even in flowers of the same tree, and accordingly has little diagnostic value. The form of anthers and their orientation is of much greater usefulness for specific delimitation.

Key to the Species of *Moronobea*

1. Leaves acuminate.
  2. Flowers relatively small, i.e., petals 2–3 cm long, usually pink but sometimes white or yellowish; widespread. 1. *M. coccinea.*
  2. Flowers relatively large, i.e., petals ca. 4 cm long, usually white; apparently confined to inundable land near Manaus, Amazonas, Brazil. 2. *M. pulchra.*
1. Leaves with apex rounded, obtuse, retuse or sometimes very abruptly short-pointed; flowers white or whitish.
  3. Stamens spirally contorted, the fruit correspondingly engraved.
    4. Flowers relatively small, i.e., the petals 4 cm or less in length; essentially confined to Río Negro drainage (see exception).
      5. Leaves oblanceolate-obovate, obtuse, often retuse, coriaceous or chartaceous, the blades commonly 6–8 cm long, 2–4 cm broad. 3. *M. riparia.*
      5. Leaves obovate, very shortly and abruptly pointed, firmly subcoriaceous (ex descr.). 4. *M. rupicola.*
    4. Flowers relatively large, i.e., the petals 6–10 cm in length; confined to the eastern Guayana Highland; blades firmly coriaceous, oblanceolate, often broadly so, commonly 8–15 cm long, 5–6 cm broad; styles subfiliform, 5–7 cm long, exserted in anthesis, style branches 2–3 mm long. 5. *M. jenmani.*
  3. Stamens erect, not spirally contorted; styles short, included or barely exserted at anthesis, ovary and fruit not spirally engraved; petals commonly 4–5 cm long; leaves obovate to oblanceolate, firmly coriaceous, obtuse, occasionally apiculate.
    6. Petioles 3–5 mm broad, blades broadly elliptic to elliptic obovate, thickly coriaceous, little or not at all punctate beneath, 5–9 cm broad, obtuse, rounded, sometimes apiculate; styles coarse, 1.5–2.0 cm long, style-branches 8–10 mm long; branchlets coarse, stiff, 6–8 mm diam. 6. *M. intermedia.*
    6. Petioles 1–2 mm broad, blades oblanceolate, obtuse, merely subcoriaceous, strongly punctate beneath, 1.5–3.0 cm broad, 3–6 cm long; styles slender, 1.2–1.4 cm long, style-branches 2–3 mm long; branchlets slender, 2–3 mm diam. 7. *M. ptaritepuiana.*

1. **Moronobea coccinea** Aublet, Hist. Pl. Guiane Fr. **2**: 789; **4**: tab. 313 (excl. Fig. a–j, which are of *Symphonia globulifera* L. f.). 1775.

M. grandiflora Choisy in DC. Prodr. **1**: 563. 1824.
M. montana Schlecht, Linnaea **8**: 189. 1833.
M. candida Ducke, Arch. Jard. Bot. Rio de Janeiro **5**: 173. 1930, type: In silvis non inundatis prope Juruty Velho ad civitatis Pará fines occidentales, 27–5–1927 fructifer, *H. J. B. R. n. 21.277* (''bacury bravo'' appellata), et ad flumen Curuca prope Manaos civitate Amazonas, 4–6–1927 florifera *H. J. B. R. n. 21.276* (RIO, NY).
M. coccinea Aublet, var. *attenuata* Eyma, Med. Bot. Mus. Herb. **4**: 24. 1932, type: Tapanaloni R, near Doemansingi [Suriname], *B. W. n. 4178* (U, NY).
Symphonia grandiflora L. C. Rich. ''mms. in Herb. Franquev. not Choisy in Herb. Paris.''

Distribution. Venezuela, eastern Colombia, Guiana and the Amazon Basin of Brazil.

M. coccinea is probably the most widespread of all moronobeas. It is characterized chiefly by relatively small and thin abruptly but sharply acuminate leaves, ''pink'' or ''white'' or ''yellow with pinkish margins'' petals, and stamen bundles with 3–4(5) stamens.

M. candida is described as large trees on non-inundable areas growing in forests of the middle Amazon Valley between Santarem and Manaus. The flowers also are said to be white but somewhat smaller than those of the preceding, thus coming within the normal size range of *M. coccinea.* It is not improbable that such trees are best assigned to *M. coccinea,* but Ducke (l.c.) seems to associate his collections most closely with *M. pulchra.*

The var. *attenuata* is said to differ in paler undersurface of leaves, more gradually tapering flower buds, and larger yellow-white petals to 4.5 cm long with rosy margins.

2. **Moronobea pulchra** Ducke, Arch. Jard. Bot. Rio de Janeiro **3**: 313. 1922.

Type. In campina arenosa ad Ponta Negro prope Urbem Manaos, civitatis Amazonas capitalem, 1. *A. Ducke* 20–11–1910 florif. *n. 11,200* (Río). I have seen *Ducke 13649* (NY, P, G, Río), and in addition *Coelho 2937* (NY) and *Ducke*, Manaos, Oct–Nov 1931, s.n. (GH).

A white or pale large flowered form of small stature. Collected on inundable sites near Manaus, Amazonas, Brazil. It is improbable that this population is specifically distinct from *M. coccinea*, from which it apparently differs only quantitatively. More likely the varzea population constitutes an ecological variant.

3. **Moronobea riparia** Spruce ex Pl. & Tr. Ann. Sci. Nat. IV. **14**: 296. 1860.

M. riparia var. *fimbrillata* R. E. Schultes, Bot. Mus. Leafl. **17**: 15. 1955, type: Puerto Colombia, Río Guainía, Colombia, *Schultes, Baker & Cabrera 18206*.

M. riparia var. *piraparanensis* R. E. Schultes, Bot. Mus. Leafl. **17**: 16. 1955, type: Comisaria Vaupés, Río Piraparaná, Caño Oomooña, *Schultes & Cabrera 17147*.

Type. Ad flumina Casiquiari, Vasiva et Pacimoni (Venezuela), *Spruce 3550* (NY, GH).

Distribution. A medium sized, white flowered, largely riverine tree of the upper Río Negro-Río Guainía drainage of Colombia and Venezuela, viz., the Ríos Içana, Vaupés, Atabapo, Pacimoni, etc. A single collection, *Wilson-Browne 544* (NY), from Iramaipang, Kanuku Mts., British Guiana, alt. 1500 ft., seems referable here.

The variety *fimbrillata* was distinguished from typical *M. riparia* because of fimbrillate and somewhat more greenish petals. Eight of the eleven flowering specimens of *M. riparia* available to me have fimbrillate petals, however showing considerable variability in prominence of this character. The three other specimens showed incipient marginal ornamentation. No geographical pattern is evident. It may, therefore, be properly concluded that seldom, if at all, are the petal margins perfectly smooth. Neither the type of var. *fimbrillata* nor the two cited paratypes have been available to me.

The var. *piraparanensis* is said to be characterized by larger flowers with petals 7 cm long and leaves larger and subacute. A single specimen cited, the type, has not been available to me. Of materials examined, petals normally vary in length from 3 cm to 5 cm.

4. **Moronobea rupicola** R. E. Schultes, Bot. Mus. Leafl. **17**: 17. 1955 (ex descr.).

Type. Tree 30–40 feet tall, Cerro Isibukuri, Rio Kananari, Comisaria del Vaupés, Colombia, 4 Aug 1951, *Richard E. Schultes & I. Cabrera 13384*. (Type said to be at Gray Herb.). Known only from the type locality.

The plant so designated by Schultes was related by him to *M. ptaritepuiana* Steyermark of the Gran Sabana region of Venezuela, but differs in having ". . . abruptly acuminate (instead of apically rounded) leaves which are larger, by having three (instead of five) anthers in each staminal bundle, by its much shorter pedicels and by its lemon-yellow and basally pink (instead of greenish white and apically pink) petals."

No specimens of *M. rupicola* have been available to me. The diagnosis and admirable plate indicate spirally contorted stamens (in the description 3, in the plate 4). Thus, on morphological grounds, for these specimens there may be indicated a stronger relation with *M. pulchra* and/or *M. coccinea*. But Schultes is correct in associating *M. rupicola* with *M. ptaritepuiana,* insofar as to their occupancy of Roraima sandstone areas.

5. **Moronobea jenmani** Engl. Fl. Bras. **12**¹: 467. 1888.

Moronobea jenmani occupies low altitude (400–1200 m) woodland or savanna areas, and was earlier thought by me to be the low altitude analogue of *M. intermedia.* However, the spiral arrangement of the stamens, the feeble cohesion of the filaments forming the discrete stamen bundles, the delicacy of the anthers, and the very long slender style, all mark the distinctness of *M. jenmani.* Considerable plasticity is found in leaf form and texture.

Key to the varieties of *Moronobea jenmani*

1. Leaf blades broadly obovate, rounded, 8–12 cm long, 4–6 cm broad, thickly coriaceous; plants of savanna or open areas. var. *jenmani.*
1. Leaf blades oblanceolate to elliptic-oblanceolate, obtuse, acutish, or apiculate, commonly 10–14 cm long, 3–6 cm broad, veins more prominent beneath, subcoriaceous plants of woodlands. var. *fanshawei.*

Moronobea jenmani Engl. var. **jenmani**

Type. Kaieteur Savanna, British Guiana, *Jenman 949* (K, photo NY).

Besides the type, only one additional collection of var. *jenmani* is known to me, viz., *Maguire & Fanshawe 23442,* from the Kaieteur Savanna. This topotype, a fruiting collection, is a close match of the flowering type specimen.

Moronobea jenmani Engl. var. **fanshawei** Maguire, var. nov. Fig. 60.

A var. *jenmàni* differt foliis maioribus, oblanceolatis vel elliptico-oblanceolatis, obtusis, acutiusculis vel apiculatis, vulgo 10–14 cm longis, 3–6 cm latis.

Type. Tree exceeding 10 m, with copious yellow latex; calyx green, buds yellow, petals cream colored, yellowish-green towards margins, pink towards center; common in forest, alt. 2450 m between Chinowieng and Mt. Ayanganna, British Guiana, 22 Jul 1960, *S. S. Tillett, C. L. Tillett & R. Boyan 44904* (holotype NY). Paratypes. BRITISH GUIANA, Pakaraima Mts.: Imbaimadai woodland, *Maguire & Fanshawe 32234, 32235;* woodland, Chinowieng, *Maguire, Bagshaw & Maguire 40658;* forest Utschi Mouth, Kamarang River, alt. 2100 ft, *Tillett & Tillett 45822;* Partang River, *Tillett, Tillett & Boyan 44846.* VENEZUELA: Roraima, Arabupa, *Tate 238* (NY).

6. **Moronobea intermedia** Engl. in im Thurn, Timehri **5**: 189. 1886; Trans. Linn. Soc. II. **2**: 271. 1887.

Type. Roraima [Venezuela], *F. im Thurn 337* (K, photo NY).

Moronobea intermedia is a higher montane species confined to the sandstone mesas of the eastern Guayana Highland. Superficially in habit and in general facies it appears to merge with *M. jenmani,* a species of greater size, larger flowers and larger more variable leaves, which occupies lower altitude on the sandstones of the eastern Highland region. But the two are invariably distinguishable by erect alignment of the stamens and the consequent lack of spiral engravature of the ovary and fruit, and the much shorter stout style of *M. intermedia.*

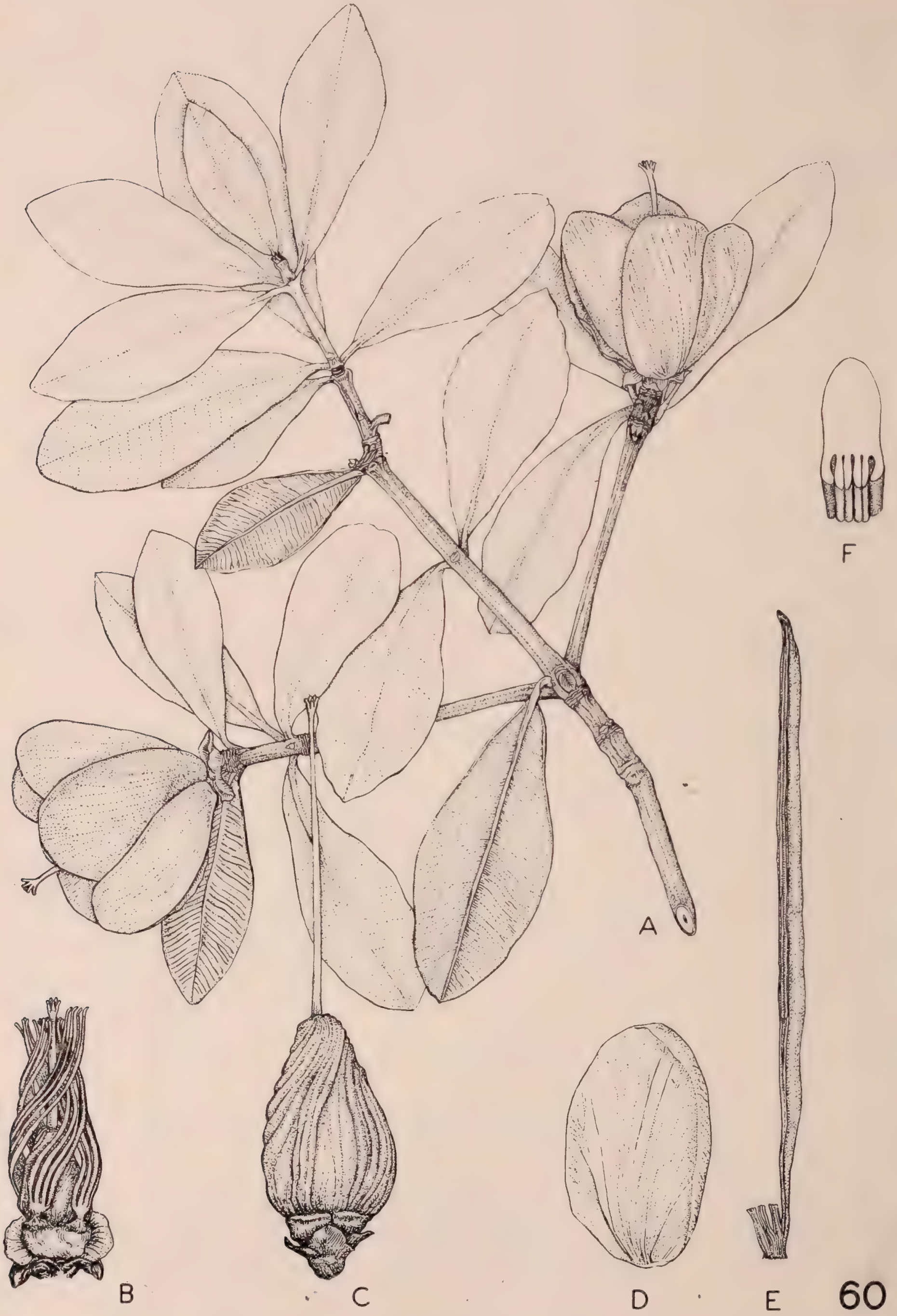


FIG. 60. *Moronobea jenmani* var. *fanshawei*. A, habit, × 0.5. B, pistil and spirally arranged anthers, × 0.5. C, maturing ovary, × 0.5. D, petal, × 0.25. E, anther, × 1. F, anther, cross-section, × 5.

M. intermedia seems to be most closely related to *M. ptaritepuiana,* which shares a similar androecial insertion. But this latter species, although occupying comparable ecological habitats, is easily recognized by its smaller, thinner leaves, smaller flowers and slender branchlets.

Distribution. BRITISH GUIANA: Mt. Ayanganna, Pakaraima Mts., alt. 1400–1500 m, *Tillett, Tillett & Boyan 45094.* VENEZUELA: Mt. Roraima, *im Thurn 337* (holotype K); *Ule 8663* (K, photo NY); Serra do Sol, *Maguire & Maguire 40445, 40383;* Ilu-tepui, *Maguire 33366, 33491, 33574.*

7. Moronobea ptaritepuiana Steyermark, Fieldiana Bot. **28**: 395. 1952.

Key to the Subspecies of *Moronobea ptaritepuiana*

1. Blades dark green, 3–5 cm long, 1.5–2.5 cm broad. subsp. *ptaritepuiana.*
1. Blades pale green, 5–8 cm long, 2.0–3.5 cm broad. subsp. *neblinensis.*

Moronobea ptaritepuiana Steyermark, subsp. **ptaritepuiana**

Type. Tree 50–60 ft tall, alt. 1585–1600 m, Ptari-tepuí, Edo. Bolívar, Venezuela, *J. A. Steyermark 59985* (F, NY).

Distribution. Apparently confined to high altitudes of the sandstone mesas of the Gran Sabana, Bolivar, Venezuela: Auyán-tepuí, alt. 1600 m, *Cardona 2625* (NY); Chimantá-tepuí, alt. 1700 m, *Steyermark 75689* (NY). Forma *rosea* Steyerm. has been distinguished by its rose-colored petals. Type. Cerrao-tepuí (Ptari-tepuí), *Steyermark 60892* (F, NY).

Moronobea ptaritepuiana Steyermark subsp. **neblinensis** Maguire, subsp. nov.

Arbor parva; foliis maioribus, laminis 5–8 cm longis, 2.0–3.5 cm latis, pallidis, glandulo-punctatis, saepe item rubripunctatis, floribus maioribus, petalis albidis 4–5 cm longis; phalangis 3–4-antherifes.

Type. Tree 5 m high, petals white, young fruit greenish-white, occasional, slopes Cañon Grande below Cumbre Camp, alt. 1800 m, Cerro de la Neblina, Amazonas, Venezuela, 14 Dec 1957, *Bassett Maguire, J. J. Wurdack & Celia K. Maguire 42466* (holotype NY). Paratypes. Cerro Neblina: *Maguire, Wurdack & Bunting 37336; Maguire, Wurdack & Maguire 42172.* Known only from Neblina.

As observed in the field, the subsp. *neblinensis* is considerably smaller than is indicated for the tree of the Gran Sabana. The western race exhibits larger, thinner and conspicuously paler leaves and larger flowers. The number of anthers per phalange has proved to be variable in general for species of *Moronobea,* and is not here considered significant. Steyermark ascribes 5 per phalange for subsp. *ptaritepuiana.* As noted above, we have observed 3–4 for subsp. *neblinensis.*

In addition to numerous minute impressed clear glandular punctae that are characteristic for the species, the leaves of subsp. *neblinensis* exhibit raised reddish and larger subepidermal pustules of an apparently resinous nature. They are often of irregular size and distribution on the lower leaf surface. These resin-dots are not associated with any fungal pathogen. They may be of natural secretion, but the possibility of their being insect induced should not be ruled out.

3. Lorostemon Ducke, Arch. Inst. Biol. Veg. **1**: 210. 1935.

Type species. *Lorostemon bombaciflorus* Ducke.

Key to the Species of *Lorostemon*

1. Sepals 9–11, gradate; peduncles short or essentially lacking, bracteate; leaves obovate to elliptic, 10–15 × 4–6 cm, abruptly acuminate, conduplicate.
    2. Body of the fruit falcately elliptic, acutish at both ends, ca. 12 cm long, 4 cm broad, pericarp thick, woody, coarsely longitudinally ribbed; stipe 8–10 mm diam; petals 80–105 × 10 mm; anthers ca. 5 per phalange, completely connate; lower Río Negro. 1. *Lorostemon bombaciflorus.*
    2. Body of the fruit oblong, broadly obtuse at both ends, 6–7 cm long, 3 cm broad; pericarp baccate, less strongly ribbed, stipe slender, smooth, 5–7 mm diam; Río Vaupés, Colombia. 2. *Lorostemon stipitatus.*
1. Sepals 5, not gradate; peduncles, superior to the bracts, naked, crassate, turbinate; petals 80–90 × 20 mm; leaves oblong-elliptic, 18–22 × 6–7 cm; apex plane, acuminate, stamens 10–12 per phalange, filaments adnate only below the middle. 3. *Lorostemon colombianus.*

1. Lorostemon bombaciflorus [21] Ducke, Arch. Inst. Biol. Veg. **1**: 210. 1935.

Type. *A. Ducke* fruct. *III–1932* (RB); florif. 14–6–1933 (cum ligno no. 218), *H.J.B.R. no. 23,768* [RB, NY (2)].

I have seen in addition to the types, all from the vicinity of Manaus, the following: *Ducke 944,* flowering [GH (2), NY]; *Ducke 1200,* a specimen with mature fruit (NY).

Distribution. So far collected only from inundable land near Manaus, Amazonas, Brazil.

2. Lorostemon stipitatus Maguire, sp. nov. Fig. 61 F–G.

Arbor mediocris latice albo; ramulis glabris castaneis pauciangulatis, internodiis 3–5 cm longis; foliis oppositis, laminis firme chartaceis vel subcoriaceis, lanceolatis vel oblongo-lanceolatis vulgo 10–13 cm longis, 4–5 cm latis, basi obtusa, apice abrupte conduplicato-acuminato, venis lateralibus, parallelis, prominentibus, 1.5–2.5 mm distantibus, obscure in nervo marginali collectivo; floribus sessilibus vel subsessilibus; bracteis pluribus, ovato-acuminatis ad 5 mm longas; sepalis 9–11 ovatis, acutis, gradatis, ad 12 mm longos; corollis et staminibus non visis; fructibus baccatis non dehiscentibus, oblongis, 6–7 cm longis, 5–7 cm latis, valde longitudine costatis, pericarpio laevi; stipite tenui, laevi, 6–7 cm longo, 4–5 mm diam.; seminibus 2–3, oblique oblongis, ventraliter compressis, ca. 2.5 cm longis, 2.0 cm latis, castaneis, testa dura, ca. 0.5 mm crassa.

Type. Medium sized tree with sparse white latex, lower course of Río Piraparaná (tributary of Río Apaporis) Vaupés, Colombia, 9 Mar 1952, *R. E. Schultes & I. Cabrera 15910* (holotype NY).

In an earlier paper (l.c.) I referred to this collection, indicating at that time a disinclination to describe it without flowering material. No additional collections have been made, but, in view of a better understanding of *Lorostemon* and its relatives, it now seems desirable to include this distinct element in the present review of the genus.

Its closest relative is *Lorostemon bombaciflorus,* but differs in subtle leaf characters, in longer, narrower acuminate bracts, and chiefly in the fruit.

---

[21] Ducke treated *Lorostemon* as a neuter noun, giving the original spelling of the binomial as *Lorostemon bombaciflorum.* In conformity with generally accepted usage that generic names terminating in *stemon* (example *Penstemon*) should be considered masculine, I have adjusted the ending of specific epithets to the masculine form.

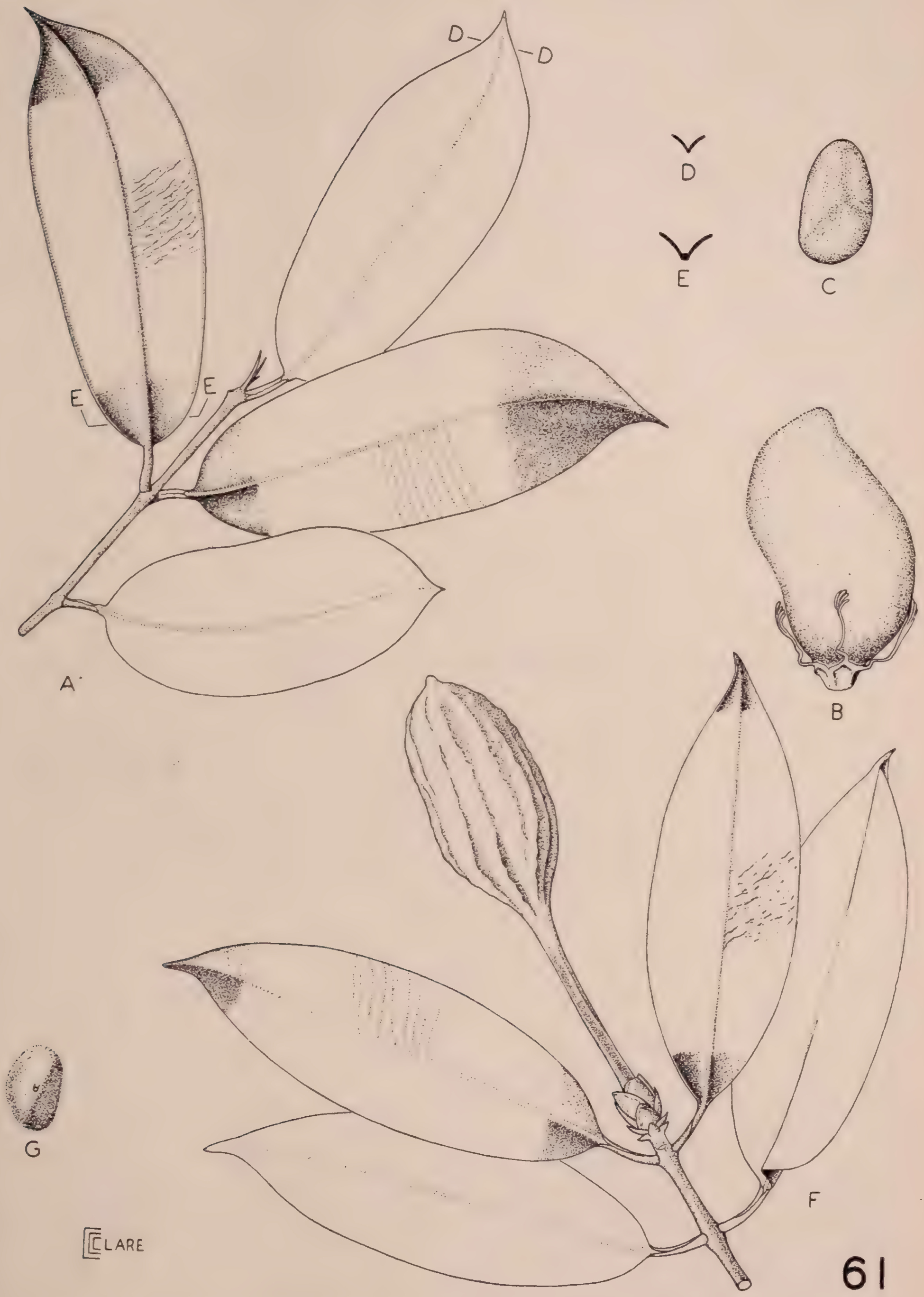


FIG. 61. A–E, *Thysanostemon fanshawei.* A, habit, × 0.5. B, fruit, × 0.5. C, seed, × 0.5. D, leaf-tip, cross-section, × 0.5. E, leaf-base, cross-section, × 0.5. D–D, position of D. E–E, position of E. F–G, *Lorostemon stipitatus.* F, habit, × 0.5. G, seed, × 0.5.

3. **Lorostemon colombianus** Maguire, Bot. Mus. Leafl. **18**: 159. 1958.

Type. Río Ricapuyá, Río Apaporis, Amazonas, Colombia, *Schultes & Cabrera 17638* (holotype NY). Paratype. Same locality, *Schultes & Cabrera 17619* (NY).

Distribution. So far collected only in the Río Vaupés basin, Comisaría Vaupés, Colombia, and Igarapé Caburí, Río Negro, Amazonas, Brazil (*Froes 28729*, NY).

4. **Thysanostemon** Maguire, gen. nov.

Sepala 5, cyclica quincunciala; petalis 5, sepalis oppositis, dextrorse imbricatis, lineari-oblongis; antheris 25 minusve in quinque phalangibus aggregatis, filamentis ex toto in ligulo connatis, antheris extrorsis; gynobasi prominenti; ovario 5-loculari, sessili; ovulis pluribus axillaribus; stylo non differenti.

Arbor parva latice pallido, moderato; ramulis tenuibus; foliis oppositis.

Type. *Thysanostemon pakaraimae* Maguire.

The name from thysanos, θυσανος, fringe, and stemon, στήμων, stamen.

Key to the Species of *Thysanostemon*

1. Leaves subchartaceous, elliptic-lanceolate, 6–13 cm long, 2.5–4.5 cm broad; base acute, apex gradually acuminate, plane. 1. *Thysanostemon pakaraimae.*
1. Leaves subcoriaceous, elliptic-oblong to oblong, 10–14 cm long, 4–6 cm broad, obtuse at the base, apex abruptly conduplicate. 2. *Thysanostemon fanshawei.*

1. **Thysanostemon pakaraimae** Maguire, sp. nov. Fig. 62.

Arbor parva, ramulis tenuibus, laevibus, castaneis, internodiis vulgo 1–2 cm longis; foliis oppositis vel suboppositis, petiolis tenuibus 8–10 mm longis, plus minusve anguste quadrialatis, transverse tessulatulis vel aliquando rimosis, laminis elliptico-lanceolatis vel oblanceolatis, vulgo 8 cm longis, 2.0–3.5 cm latis, firme chartaceis, paucipunctatis, basi acuta, apice acuminato, costa subprominenti, venis lateralibus prominulis, parallelis, adscendentibus ad 10° angulatas, canalibus laticiferis evidentur adscendentibus ad 40°–45° angulatos; floribus solitariis, subterminalibus; pedunculis 2–3 cm longis, aliquantum clavatis, laevibus, ebracteatis; sepalis 5, cyclicis quincuncialibus, ovato- vel obovato-orbicularibus, 5–7 mm longis, 5–10 mm latis; petalis sepalis oppositis, 5, lineari-oblongis, 3.5–4.0 cm longis, 1.0–1.4 cm latis, dextrorse imbricatis, carnosulis, rubritinctis, ad basim gynobasis affixis, apice rotundato, cucullato; staminibus 20–25 in quinque phalangibus aggregatis, quisque 4–5 staminibus instructa; filamentis ex toto in ligulo connatis, solum antheris libris, ligulis planis ca. 2 cm longis, 3 mm latis; antheris extrorsis, apice incurvato, linearibus, 2-locularibus, apice incurvato, connectivo rotundato, filamentis ex toto lateraliter connatis, ligulis 2.0–2.5 cm longis, 2.0–2.5 mm latis, planis; gynobasi ca. 8 mm longa; pistillis oblongo-lanceolatis, ovario 5-loculari, ovulis pluribus in loculo quoque, axillaribus, medio affixis, stylo non conspicue differenti, ramulis ca. 1 mm longis recurvatis; fructibus et seminibus non visis.

Type. Small tree with slender branches, latex pale, scanty, flowers coralline, hardly opening in anthesis; infrequent in woodland dominated by *Dicymbe* spp., head of Kopinang Falls, alt. 925 m, Potaro River–Essequibo River drainage, Pakaraima Mts., British Guiana, 31 Aug 1961, *Bassett Maguire, Celia K. Maguire & G. Wilson-Browne 46026* (holotype NY). Several small trees were noted at the type station.

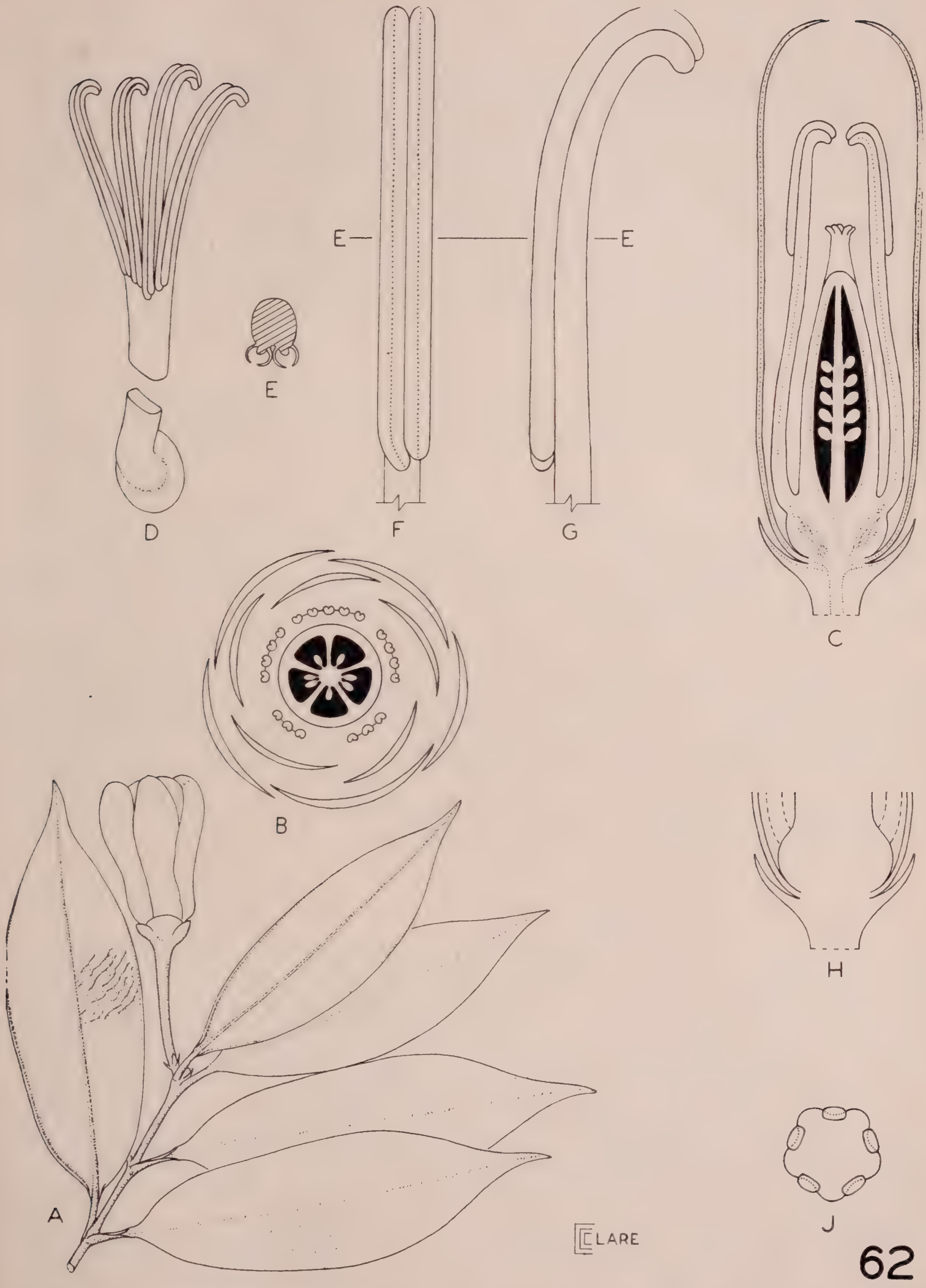


FIG. 62. *Thysanostemon pakaraimae.* A, habit, × 0.5. B, floral diagram. C, flower, long-section, × 1.5. D, phalange bearing 4 anthers, × 3. E, stamen, cross-section, × 5. E–E, position of E. F, stamen, ventral view, × 5. G, stamen, lateral view, × 5. H, gynobase, × 1.5. J, gynobase, cross-section, × 0.5.

2. **Thysanostemon fanshawei** Maguire, sp. nov. Fig. 61, A–E.

Arbor parva, latice flavido; ramulis tenuibus, laevibus, castaneis, internodiis evidenter 2–3 cm longis; foliis oppositis, laminis subcoriaceis vel coriaceis oblongis vel ellipticis vel oblanceolato-oblongis, vulgo 12–15 cm longis, 4.0–4.5 cm latis, costa prominenti, venis lateralibus horizontaliter parallelis prominulis, evidenter nigro-punctatis, apice abrupte acuminato, conduplicato, basi obtusa aliquantum vel valde conduplicata, petiolis 12–15 mm longis, ca. 2.5 mm crassis, aliquantis quadrangularibus, in dorso anguste alatis, transverse tessellatis; pedunculo laevi, subclavato ca. 2 cm longo; sepalis marcescentibus; floribus non visis; fructibus ovoideo-conicis, abrupte oblique acuminatis, baccatis immaturis, maturis siccantibus, pericarpiis laevibus caperatis tenue chartaceis; seminibus paucis, possibiliter 3–4, oblique ovoideis, saepe compressis, ca. 3.0–3.5 cm longis, 2.5 cm latis, testa laevi tenui indurata.

Type. Tree 30 feet high, 4 inch diam, from damp places in Kakaralli-Clump Wallaba forest, mile 107, Bartica-Potaro Road, British Guiana, 11 Nov 1943, *D. B. Fanshawe 1446* (*F.D. 4182*) (holotype K, isotype Georgetown Forest Dept.).

The collector, D. B. Fanshawe, a keen observer and competent botanist, in field notes described the fruit as ''ovoid conical, slightly twisted, pale green—pericarp soft—seeds 8, oblong, rounded on one side, br., embedded in pith.'' In the two fruits before me the indications are that no more than four mature seed could be fitted into the fruit shell.

There is little doubt as to the immediate relationship of *Thysanostemon fanshawei* with *T. pakaraimae,* although for the first, flowers are not available, and for the second no fruiting material has been seen. Both are represented only by the type collections. The distinguishing and differentiating features employed here are foliar, but the distinction is unmistakable.

5. **Symphonia** Linnaeus f. Suppl. 49, 302. 1781.

Moronobea Aubl., Pl. Guiane 778, in part. 1755.

Type species. *Symphonia globulifera* L. f.

Perrier (Flore de Madagascar, Fam. 136. pps. 13–31. 1951) accounts for sixteen species in the flora of Madagascar, including the African *S. globulifera.* Chief morphologic differences and criteria upon which the sixteen taxa are distinguished are (1) size and form of leaf, (2) incidence of anthers per phalange, (3) size of flower and arrangement of inflorescence. Although there is insufficient material from Madagascar in American herbaria upon which to form judgment, it does seem, from M. Perrier's account, that differentiation of Madagascar elements of the genus may have proceeded more actively than that of the American congener, and in Madagascar may well indeed have developed a number of consistently and discretely established species. This development does not seem to have obtained in America.

It is true that *Symphonia globulifera* in the Neotropics is a plastic and variable species, and that leaf form, flower size, and inflorescence size extend through considerable metric range. Differences in size or texture of the leaves are insensibly confluent and extreme, and do not seem to be correlatable with any geographic or ecologic segregation or isolation, but rather flow generally throughout the entire population.

For these reasons no infrageneric or infraspecific taxa are herein recognized at this time.

1. **Symphonia globulifera** L. f. Suppl. 49, 302. 1781.

Moronobea coccinea Aubl. Pl. Guiane 778, in part, and as to Figs. a–j, *pl. 313.* 1775.
Symphonia globulifera L. f. var. *macoubea* Vesque in DC. Monogr. **8**: 229. 1873.
S. globulifera L. f. var. *major* Diels, Notisbl. **15**: 49. 1940.
S. microphylla Schultes, Bot. Mus. Leafl. **17**: 20. 1955.
S. utilissima Schultes, Bot. Mus. Leafl. **17**: 22. 1955.

Type. Habitat in Surinamo. *C. G. Dalberg* (Linn.).

Distribution. Widespread in tropical America, normally growing in rainforest or swampy areas; Costa Rica and Honduras south to Peru and east to the West Indies, Venezuela, and Guianas and Brazil; tropical Africa.

MELASTOMATACEAE [22]

With the exception of several problems of megamonographic scope, this paper completes consideration of the undescribed taxa collected by recent Guayana Highland expeditions. Starting with Dr. Gleason's first large-scale consideration of Guayana Melastomataceae in the Duida report, about 200 novelties in the family have been described for this area. It is regrettable that such a great portion of the Lost Worlds region is still completely unexplored and that even the flora of those general regions which have been visited is still so little known. Certainly for new morphologic variants, no other land portion of the world is today comparable.

Many of the following conclusions concern problems set aside during several years for more considered judgment; my two preceding familial installments in the Flora of the Guayana Highland have included the easier taxonomic decisions. The studies would not have been possible without generous loans of critical material from various European and American herbaria (F, G, IAN, K, L, M, MG, NY, P, R, RB, S, U, US, VEN, W); their cooperation has been greatly appreciated. The illustrations have been provided by C. C. Clare and M. L. Solt.

Ernestia pullei Gleason.

Two Venezuelan collections (*Maguire 32697, Maguire, Wurdack, & Bunting 35855*), from iron-ore mountains (Cerro Bolívar, Cerro Altamira) in Edo. Bolívar, agree fairly well with the holotype (from Surinam) and with *Guppy 333* (Acarai Mts., British Guiana-Brazil frontier), differing only in the finer leaf serrulation and somewhat more granular lower leaf surface pubescence. In the original description, Gleason described the ovary as 4-celled, mentioning, however, Pulle's 3-celled *adnot* on the type sheet. The type is in poor condition, but all of the non-disintegrated fruits seem to be 3-celled; both the Acarai Mts. and Venezuelan collections have predominantly 3-celled ovaries, with only one of the many available fruits on *35855* being 4-celled. I have compared a photograph and fragment (leaf and capsule, NY) of the type of *Brachypremna petiolata* Gleason with *E. pullei* and the match is excellent. In his discussion of the new genus, Gleason compared *Brachypremna* with *Ernestia,* but erred in differentiating the genera on the bases of flower-mery and habit. Absolute synonymization of *Brachypremna* pends my personal examination of the holotype; since both species were published in the same paper, no nomenclatural adjustment will be needed.

---

[22] J. J. Wurdack, Dept. of Botany, U. S. National Museum.

Ernestia cataractae Tutin.

In two isotypes (K, US) examined, the ovary is 4-celled and the dorsal calcar on the large stamen connectives is acute, while the hypanthium is 6–7 mm long. Three recent Venezuelan collections—from the Chimantá Massif (*Steyermark & Wurdack 1283*), Cerro Parú (*Cowan & Wurdack 31444*), and Cerro Guanay (*Maguire, Phelps, Hitchcock, & Budowski 31766*)—seem referable to *E. cataractae,* although generally having slightly smaller (3–4.5 mm) hypanthia and usually blunt dorsal connective calcars. The Amazonas collections resemble the British Guiana material in foliage, but the Chimantá collection has more definitely 5-nerved (and occasionally sub-7-nerved) leaf blades. The scanty material thus far collected does not suggest subspecific distinction.

E. pullei Gleason seems separable from *E. cataractae* most easily, apart from the 3-celled ovary, by the more definitely developed panicle and the setose (rather than merely acute) ends of the ventral connective lobes. *E. minor* Gleason has prostrate stems and a 3-celled (in two fruits examined) ovary. *E. rubra* Pulle has a definitely developed panicle, short calyx lobes, and setose ventral connective prolongations in the large stamens (but a 4-celled ovary). Further blurring Cogniaux' sectional distinctions in *Ernestia* is the predominantly 3-locular fruit of numerous recent Venezuelan and Colombian collections of *E. tenella* (Bonpl.) DC. var. *sprucei* Cogn.; the available material did not permit establishment of the dominant carpel number of *E. tenella* var. *tenella,* but of 9 fruits clearly seen, 5 were 3-celled and 4 were 4-celled. The puberulent ovary of *E. tenella* distinguishes it from all Guiana species. *E. lata* Gleason (Bull. Torrey Club **52**: 328. 1925) is synonymous with *E. tenella* var. *sprucei;* the holotype of *E. lata* shows slightly abortive anthers and leaf blades caducously glandular-setulose on both sides, while the other differential characters cited in the original description have been negated by recent collections.

Ernestia maguirei Wurdack, sp. nov. Fig. 63, k–q.

E. rubrae Pulle affinis sed foliis basi rotundatis vel vix cordatis stylo glanduloso-puberulo.

Rami petiolis foliis subtus inflorescentiis hypanthiisque dense glanduloso-setulosi pilis gracilibus. Petioli 4–9 mm; lamina 2–3 × 1–1.5 cm oblongo-ovata apice anguste acuta basi rotundata vel vix (ad 1 mm) cordata membranacea 5-nervata (jugo exteriori gracillimo neglecto) supra sparse laxeque strigulosa pilis gracilibus glanduliferis ad margines irregulariter serrulata. Panicula terminalis 5–8 cm longa oblonga; flores 4-meri plerumque 3–5 mm pedicellati; bracteolae 0.7–1 mm longae ovatae glanduloso-puberulae 1 mm infra hypanthii basim insertae caducae. Hypanthium (ad torum) 4.2 mm longum; calycis tubus 0.3 mm altus, lobis 1.5–1.8 mm longis oblongo-ovatis apice hebeti-acutis intus apicem versus glanduloso-puberulis. Petala 8–8.5 × 4.5 mm, asymmetrice elliptica apice obtusa et cum seta unica glandulifera. Stamina dimorphica; filamenta 5 vel 4.5–4.7 mm. Stamina maiora: antherarum thecae 5.5–5.7 mm longae subulatae, connectivo 1–1.2 mm prolongato dorsaliter cum appendice acuta 0.7 mm longa ventraliter cum appendice 1.8–2.4 mm longa bifida acuta. Stamina minora: antherarum thecae 4.5 mm longae subulatae, connectivo 0.4–0.5 mm prolongato dorsaliter vix (0.1 mm) calcarato ventraliter cum appendice bifida 1.4–1.5 mm longa acuta. Stylus 11.5 × 0.5–0.3 mm centraliter sparse glanduloso-setulosus; stigma punctiforme; ovarium 4-loculare glabrum; capsula 4-valvata; semina 0.5 × 0.35 mm cochleata tuberculata.

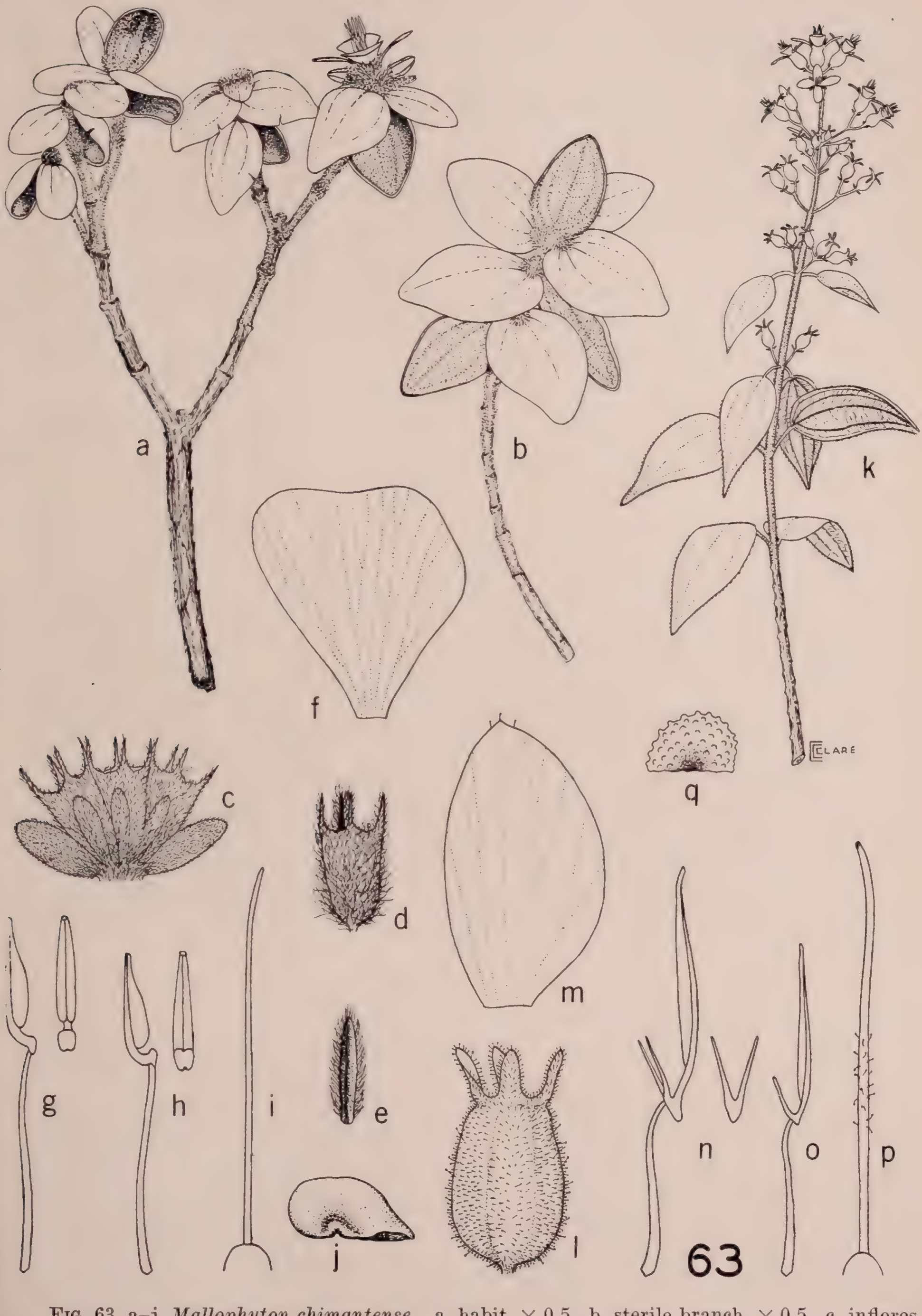


FIG. 63. a–j, *Mallophyton chimantense.* a, habit, × 0.5. b, sterile branch, × 0.5. c, inflorescence, × 2. d, hypanthium and calyx, × 2. e, flower bracteole, × 5. f, petal, × 2. g, large stamens, lateral and ventral views, × 3.5. h, small stamens, lateral and ventral views, × 3.5. i, style, × 3. j, seed, × 10. k–q, *Ernestia maguirei.* k, habit, × 0.5. l, hypanthium and calyx, × 5. m, petal, × 5. n, large stamen and ventral view of connective appendage, × 5. o, small stamen, × 5. p, style, × 5. q, seed, × 25.

Type. Shrub 0.5–1.5 m, petals magenta, frequent on summit of Sororopán-tepuí, Edo. Bolívar, Venezuela, alt. 1800 m, 17 Dec 1952, *Bassett Maguire & John J. Wurdack 33936* (holotype US 2342479).

E. rubra has acute to obtuse leaf blade bases and a glabrous style. *E. pullei* Gl. differs in its glabrous style and 3-celled ovary.

Chaetolepis phelpsiae Gleason subsp. **chimantensis** Wurdack, subsp. nov.

Hypanthium centraliter glabrum.

Type. Shrub 0.1–0.3 m, flowers yellow, frequent along lower escarpment face of Sarvén-tepuí, Chimantá Massif, Edo. Bolívar, Venezuela, alt. 1900–2050 m, 13 Jan 1953, *John J. Wurdack 34108* (holotype US 2342483). Paratype. VENEZUELA, Edo. Bolívar. Chimantá Massif: Central Section, upper falls of Río Tirica above Summit Camp, alt. 1940–1950 m, *Steyermark & Wurdack 521.*

In the typical subspecies, known only from Cerro Yaví, the hypanthium is moderately and evenly strigose and only three primary leaf veins are evident. The Chimantá population has the hypanthium sparsely strigulose on the apical 1/4 and glabrous (or very sparsely strigulose at the extreme base) otherwise; the fourth and fifth (inframarginal) primary leaf nerves are faintly developed. The paratype of *C. phelpsiae* has ovate leaves like those of the Chimantá collections, rather than the lanceolate to oblong-lanceolate leaves of the Yaví holotype. Probably the closest relative of *C. phelpsiae* is *C. thymifolia* Tr.; that Colombian species has calyx lobes 1.5 × 1.5–2 mm, while the Venezuelan relative has calyx lobes 2.5–3 mm long and 1.5–2 times as long as broad. The interpretation of *C. thymifolia* is based upon the original description, rather than any type collection study. The material referred to *C. thymifolia* includes *Grant 9651, Apolinar 584,* and *Dawe 320;* these collections differ from *C. alpina* Naud. in the gland-tipped cauline hairs and the hypanthium essentially lacking resinous glands.

From the present collections, I can see no reason for differentiating *C. citrina* Gleason from *C. anisandra* Naud., Gleason's distinctions having been blurred by new material. *C. anisandra* is known from Roraima, Auyán-tepuí, and Yutaje (*Maguire & Maguire 35322*) in the Guayana Highland, and (with completely eglandular hairs) the Sierra Perija in Colombia (*Cuatrecasas & Romero Castañeda 25164*).

Macairea chimantensis Wurdack, sp. nov.

M. asperae N. E. Brown affinis sed ramorum et venulorum primariorum foliorum subtus pilis i.s. pallidis et floribus minoribus.

Arbor parva 0.3–0.7 m alta cum ramulis foliis subtus hypanthiisque modice aureo-glandulosis; rami foliorum subtus venis primariis inflorescentiisque dense strigulosi vel breviter strigosi pilis basi robustis. Petioli 0.8–1.5 cm; lamina 3.5–6 × 1.5–3 cm oblongo-elliptica apice hebeti-obtusa vel rotundata basi late acuta crasse rigideque coriacea, supra modice tuberculato-aspera, subtus in superficie densissime setulosa (setulis ca. 0.2 mm longis), trinervata nervis primariis lateralibus submarginalibus nervis secundariis supra impressis subtus leviter elevatis ca. 2–2.5 mm inter se distantibus, marginibus incurvatis integris. Panicula 5–9 cm longa multiflora; flores breviter (ad 2 mm) pedicellati. Hypanthium 2 mm longum modice longo-strigulosum; calycis tubus 0.3 mm altus, lobis 1.5–1.8 mm longis triangularibus vel oblongo-triangularibus acutis. Petala 9–10 × 7–7.5 mm obovata apice late obtusa vel rotundata ciliolata. Stamina sub-

tiliter dimorphica; filamenta 4–5 mm longa apicem versus modice glanduloso-setulosa; antherarum thecae 2–2.2 mm longae non vel vix attenuatae, connectivo 0.5–0.7 mm prolongato basi in appendice cordiformi 0.5 × 0.7 mm expanso. Stylus 7.5 × 0.5 mm basim extremum versus sparse glanduloso-setulosus; ovarium 4-loculare densissime cum glandulis sessilibus obsitum et apicem extremum versus glanduloso-setulosum. Capsula 4-valvata; semina ca. 0.8 × 0.4 mm vix foveolata.

Type. Petals pinkish white, filaments and connective bronze, anthers yellow, frequent in lower part of lower northwest cumbre, Churi-tepuí (Murú-tepuí), Chimantá Massif, Edo. Bolívar, Venezuela, alt. 2100–2200 m, 24 Jan 1953, *John J. Wurdack 34177* (holotype US 2342486). Paratypes. VENEZUELA, Edo. Bolívar. Chimantá Massif: Churi-tepuí, alt. 2250–2300 m, *Wurdack 34208;* Central Section, alt. 1900 m, *Steyermark & Wurdack 568;* Abácapa-tepuí, alt. 1800–2000 m, *Steyermark 74855;* Apácara-tepuí, *Cardona 1555;* Acopán-tepuí, alt. 2100 m, *Cardona 2302.* Uaipán-tepuí: alt. 1900 m, *Cardona 2065.* Auyán-tepuí: alt. 2100–2200 m, *Tate 1148, Cardona 2652.*

M. aspera has rufous hairs on the lower leaf surfaces, young stems, and inflorescence, as well as sepals 3–5 mm long and anthers 3–4 mm long.

Macairea cardonae Wurdack, sp. nov. Fig. 64, a–d.

M. lanatae Gleason affinis sed foliis 7-nervatis stylo glanduloso-setuloso.

Frutex 0.5–3 m; ramuli petiolis inflorescentiis hypanthiisque dense longo-strigulosi vel brevistrigosi pilis gracilibus glanduliferis. Petioli 0.5–1.5 cm; lamina 3.5–7 × 3–4.5 cm ovata apice late acuta vel obtusa basi vix (2–5 mm) cordata crasse coriacea, supra dense tuberculato-strigosa setis glanduliferis, subtus in venis dense brevi-setulosa et in superficie densissime setulosa pilis gracilibus plerumque glanduliferis, 7-nervata nervis primariis secundariisque supra impressis et subtus leviter elevatis nervis tertiariis reticulatis. Panicula 3–5 cm longa lataque subpauciflora terminalis; flores 3–5 mm pedicellati, bracteolis 3–5 × 1.5–2 mm ellipticis ca. 2 mm infra hypanthium insertis. Hypanthium 3–3.5 mm longum; calycis tubus 0.5 mm longus, lobis 3–3.5 mm longis oblongis acutis basi remotis. Petala 14–14.5 × 13–14 mm suborbicularia apice cum setulis glanduliferis paucis ciliolata. Stamina vix dimorphica; filamenta 7 vel 5–5.5 mm longa modice glanduloso-setulosa; antherarum thecae 3.7–4 vel 3.5–3.7 mm longae apice vix subulatae, connectivo sub loculis 0.3–0.5 vel 0.7 mm prolongato, appendice cordato-rotundata 1 × 0.8–0.9 mm. Stylus 7 × 0.4 mm modice glanduloso-setulosus; ovarium 4-loculare apice dense setuliferum setulis glanduliferis ad 1.5 mm longis. Capsula 4-valvata; semina 0.7–0.8 × 0.5 mm minutissime denseque muriculata.

Type. Shrub 3 m, flowers pink, cumbre of Acopán-tepuí, Edo. Bolívar, Venezuela, alt. 2200 m, Oct 1947, *F. Cardona 2283* (holotype US 1932223). Paratypes. VENEZUELA, Edo. Bolívar. Auyán-tepuí: *Cardona 256.* Chimantá Massif: Apácara-tepuí, alt. 1800–2000 m, *Cardona 1975* (VEN), *Steyermark 75844;* Churi-tepuí (Murú-tepuí), alt. 2250–2300 m, *Wurdack 34220;* central section, Río Tirica, alt. 1900–1950 m, *Steyermark & Wurdack 604, 936.*

M. lanata has 5-nerved leaf blades and a glabrous style. Another close relative, *M. neblinae* Wurdack, has 5-nerved basally obtuse leaf blades and many-flowered inflorescences, as well as a glabrous or only basally sparsely pubescent style. The Cardona collections of *M. cardonae* had previously been identified as *M. multinervia* Benth.; that species, however, has well-developed inflorescences, smaller leaf blades, glabrous style, and predominantly 3-celled ovary.

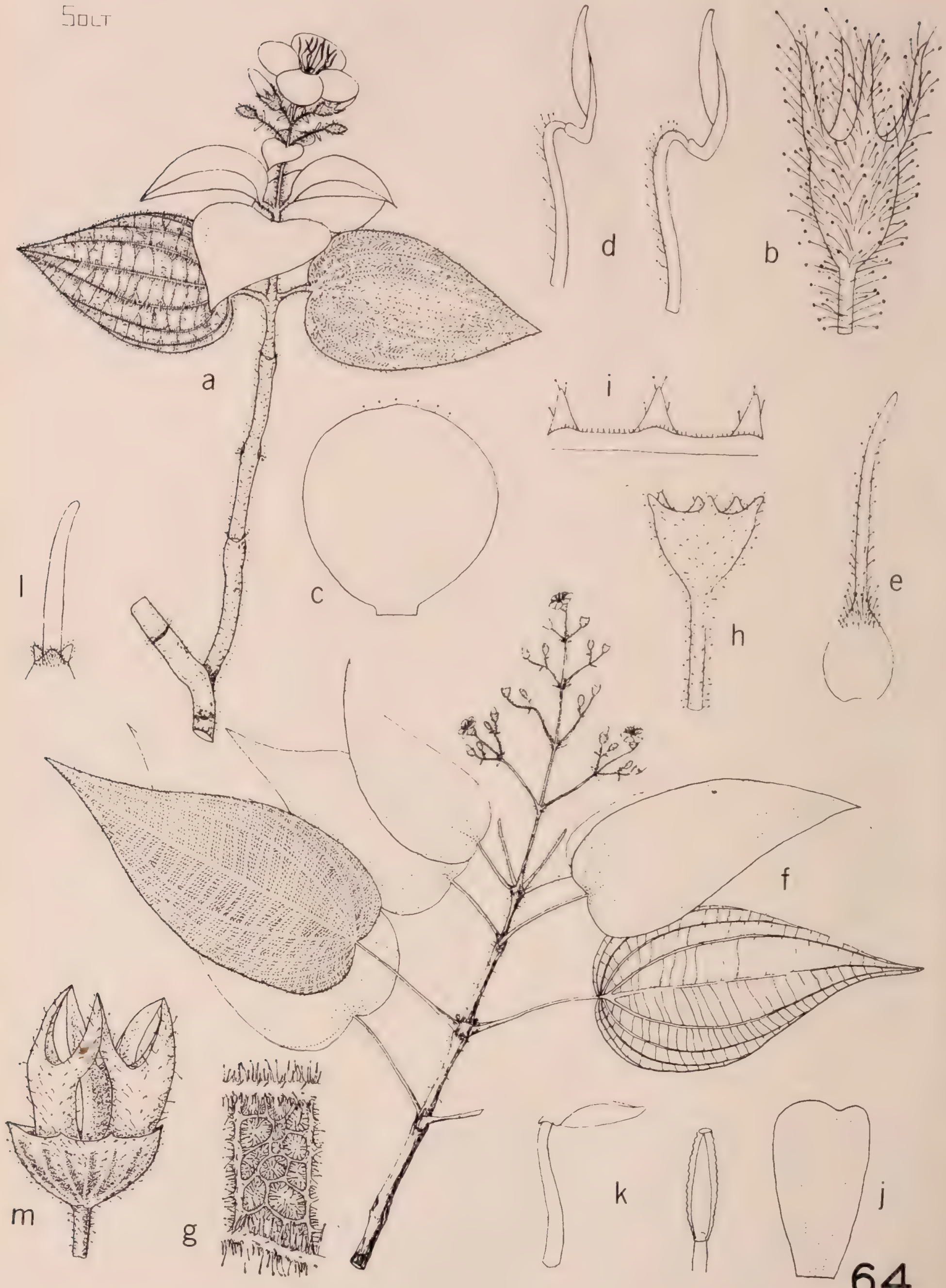


FIG. 64. a–d, *Macairea cardonae.* a, habit, × 0.5. b, hypanthium and calyx, × 4. c, petal, × 2. d, small and large stamens, × 4. e, pistil, × 4. f–m, *Neblinanthera cumbrensis.* f, habit, × 0.5. g, lower leaf surface detail, × 20. h, hypanthium and calyx, × 5. i, adaxial view of calyx, × 10. j, petal, × 8. k, stamen, lateral and dorsal views, × 8. l, ovary apex and style, × 5. m, dehisced fruit, × 5.

Macairea maroana Wurdack, sp. nov.

M. pachyphyllae Benth. affinis sed foliis distincte denticulatis floribus maioribus pedicellis longioribus connectivi appendice maiore.

Ramuli quadrangulares, vetustiores cum cortice in scidulas solutenti, novelli modice cum glandulis flavis sessilibus armati et dense setosi pilis gracilibus stramineis ad 2.5 mm longis eglandulosis. Petioli dense setosi 1–2 cm longi; lamina 7–11 × 3.5–5 cm elliptica apice acuta basi late acuta vel anguste obtusa breviter (2–4 mm) triplinervata (nervulis marginalibus indistinctis neglectis) nervis primariis lateralibus 3–4 mm ab marginibus distantibus margine irregulariter denticulata dentibus 0.5–1 mm profundis, supra modice strigoso-aspera bullis 1/mm^2 cum seta ca. 1 mm longa armatis, subtus modice (praecipue in nervis nervulisque) appresso-setosa superficie cum glandulis flavis 10–15/mm^2 armata. Panicula terminalis 4–8 cm longa lataque; bracteolae usque ad 10 × 5 mm valde caducae; pedicelli 4–9 mm longi cum hypanthio calycis lobisque densiuscule setulosi setulis stramineis glandulosis plerumque ca. 0.5 mm longis. Hypanthium 4.5–5 × 2.5–2.7 mm; calycis lobi 2.5–3.5 × 1.5 mm anguste triangulares apice extus dente glanduloso ca. 0.7 mm longo instructi. Petala 9–13 × 6–10 mm asymmetrice obovata apice rotundata et setulis glanduliferis 1–2 armata. Stamina vix inaequalia, filamentis apicem versus glanduloso-puberulis, connectivi appendice rotundato-cordata. Stamina maiora: filamenta 6.5–8 mm; antherarum thecae 4.7–5.5 mm, connectivo 1.6–3.5 mm prolongato appendice 0.9 × 0.9 mm. Stamina minora: filamenta 4.5–6.5 mm; antherarum thecae 4.5–5.5 mm, connectivo 0.8–1.3 mm prolongato appendice 1.3 × 0.9 mm. Stylus 13 × 0.4–0.5 mm basim versus modice glanduloso-puberulus; ovarium 4-loculare apice vix elongatum et sparse vel modice glanduloso-setulosum setulis 0.2–0.4 mm longis; semina 1.2 × 0.7 mm cochleata creberrime foveolata.

Type. Shrub 1.5–3 m, buds and petals white, anthers yellow, occasional at forest edge just southeast of Maroa, Río Guainía, Terr. Amazonas, Venezuela, alt. 120–140 m, 9 Oct 1957, *Bassett Maguire, John J. Wurdack, & William M. Keith 41772* (holotype US 2342588). Paratypes. Same locality data, *Llewelyn Williams 14252, Maguire, Wurdack, & Bunting 36429.*

In Gleason's synopsis of *Macairea,* this species would fall in Species-Group II near *M. pachyphylla, M. radula* (Bonpl.) DC., and *M. viscosa* Ducke. *M. radula* has thicker obtuse leaf blades which are more densely pubescent beneath and the flowers in dense bracteate glomerules; *M. pachyphylla* has entire leaf margins, lower leaf surface hairs mostly gland-tipped, smaller flowers (the petals up to 7 mm long) on shorter pedicels, and relatively much smaller stamen connective appendages; and *M. viscosa* has compact conspicuously bracted inflorescence glomerules, more strongly pubescent hypanthium, and longer calyx lobes. *M. foveolata* Cogn. [cf. *Cordeiro & da Silva 311* (NY), from Pôrto Velho, Terr. Guaporé, Brazil] has longer lower leaf surface pubescence, more compact inflorescence glomerules, much longer hypanthial pubescence, and relatively longer calyx lobes.

Macairea neblinae Wurdack.

Several large collections made during the 1957–58 Neblina exploration have slightly altered the circumscription of this species. These recent specimens show cauline pubescence often pale and styles often glabrous. These two variables are combined in parts of the collections in all four possible permutations; no infraspecific distinctions seem warranted. This variability, however, does not alter the basic distinctions from *M. rigida* Benth. enumerated in the original description of *M. neblinae.*

Tibouchina llanorum Wurdack, sp. nov.

Sect. *Barbigerae.* Ex sectionis congeneribus differt hypanthii squamis incurvo-patentibus.

Suffrutex ad 1.5 m altus; rami acute 4- vel 6-angulati petiolis inflorescentiisque dense vel modice squamis vix ciliolatis basi inferne productis armati. Folia opposita vel ternata; petioli 0.5–1 cm longi; lamina plerumque 7–12 × 4–6 cm elliptico-ovata apice late acuta basi rotundata rigidiuscula supra modice strigulosa pilis ad apicem liberum ciliolatis subtus in nervis dense squamis appressis subintegris (inconspicue appresso-ciliolatis) obsita in superficie densissime strigulosa squamis ciliolatis 5- vel sub-7-nervata nervis primariis lateralibus basi non coalitis. Panicula 4–20 cm longa oblonga; flores in ramulis brevibus conferti 2–4 mm pedicellati; pedicelli ad basim plerumque bibracteolati; bracteolae 4–6 × 4–6 mm late ovatae vel suborbiculares apice obtusae vel rotundatae extus centraliter densiuscule ciliolato-squamulosae intus glabrae persistentes. Hypanthium (ad torum) 6–8 × 4–5 mm dense squamis lanceolatis 1.5–2 mm longis incurvo-patentibus inconspicue appresseque ciliolatis obsitum. Calycis tubus ca. 0.5 mm altus, lobis 2.5 mm longis late ovatis basi contiguis extus centraliter modice squamulosis. Petala rosea 13 × 12 mm obovata apice truncata vel vix emarginata. Stamina vix dimorphica; filamenta 9–11 mm longa basim versus densiuscule setosa pilis gracilibus ad 5 mm longis; antherarum thecae 9.5–10.5 mm longae, connectivo basi 2 vel 3 mm prolongato ventraliter non prolongato sed ad basim ipsum dense setoso pilis gracilibus ad 3.5 mm longis. Stylus glaber; stigma punctiforme; ovarium apice dense sericeo-strigosum.

Type: *Sabanas* between San Carlos and Acarigua, Cojedes, Venezuela, 15 Sep 1940, *C. E. Chardon 223* (holotype US 1801638). Paratypes. VENEZUELA. Cojedes: savannas between El Tinaco and San Carlos, *Pittier 12003.* Carabobo: beside Lago Valencia, alt. 700 m, *Hermano Gines 4443.* Bolívar: *morichal* margins near Pilon 5 km northeast of mouth of Río Parguaza, alt. 90 m, *Wurdack & Monachino 41128.* COLOMBIA. Meta: *sabana* near Villavicencio "cerca de Peralonso," alt. 450 m, *Jaramillo, Mesa, Idrobo, & Fernandez 333.*

In the past, *T. llanorum* has been confused with *T. karstenii* Cogn. and *T. barbigera* (Naud.) Baill., both of which have generally smaller leaves and strictly appressed calyx pubescence as well as hypanthia only about 3–3.5 mm diam. The photograph (Gleason 88–1) of the Kew sheet of *Linden 1455* indicates that this collection, the basis of Cogniaux' Colombian record of the otherwise Brazilian and Bolivian *T. barbigera,* is actually *T. llanorum.* However, the recent Colombian material of *T. karstenii* (*Cuatrecasas 7659* from San José de Guaviare and *Garcia-Barriga 11058* from between San Francisco and Supate, Cundinamarca) shows basally sparsely strigose filaments, although otherwise agreeing closely with the type photograph (Macbride 32307). Establishment of criteria other than filament pubescence for the distinctions (if any) between *T. barbigera* and *T. karstenii* depends upon close examination of types not on hand at present. The loose hypanthial scales of *T. llanorum* serve as an ample distinction from its two relatives. Cogniaux' use of opposite versus ternate leaves in Sect. *Barbigerae* as a species-group criterion is certainly suspect in light of the variability seen in *T. llanorum; Pittier 12003* (US) has 3-whorled leaves, while one of the five duplicates in *Wurdack & Monachino 41128* has ternate leaves (with 6-angled stems) and the others opposite leaves (with 4-angled stems).

Comolia prostrata Wurdack, sp. nov.

Ex descriptione et photicone *C. berberidifoliae* (Bonpl.) DC. affinis sed habitu prostrato foliorum venis secundariis tertiariisque non evolutis et laminis minoribus hypanthio glanduloso-setuloso.

Fruticulosa e basi ramosissima; rami 5–20 cm longi divaricati nodis juvenilibus setulosis exceptis glabri. Petioli ca. 1 mm longi; lamina 3–5 × 2–4 mm obovato-elliptica apice obtusa basi acuta membranacea, supra glabra, subtus primum in nervis primariis sparse glanduloso-setulosis extemplo glabrata, indistincte trinervata venis secundariis tertiariisque non evolutis, apicem versus crenulato-serrulata serratulis primum glanduloso-setulosis extemplo glabratis. Flores in ramis brevibus terminalibus solitarii. Hypanthium 2.5 mm longum sparse glanduloso-setulosum; calycis tubus vix 0.2 mm altus, lobis ovato-oblongis apice acutis ad margines sparse glanduloso-ciliolatis. Petala 7–8 × 4.5 mm asymmetrice obovata apice obtusa et seta unica glandulifera terminata. Stamina dimorphica; filamenta 5 mm longa; antherae subulatae. Stamina maiora: thecae 3.5 mm longae, connectivo 1 mm prolongato postice distincte calcarato calcari 0.5 mm longo appendicibus ventralibus 1 mm longis. Stamina minora: thecae 3.5 mm longae, connectivo 0.5 mm prolongato postice non calcarato appendicibus ventralibus 0.5 mm longis.

Type. Entire plant red-tinged, petals pink, anthers purple-pink, locally abundant in sabanita opposite Venezuelan town of Manacal, Río Atabapo, Colombia, alt. 125 m, 12 Jun 1959, *J. J. Wurdack & L. S. Adderley 42987* (holotype US 2342626).

C. berberidifolia has the shrubby habit of the common *C. lythrarioides* (Steud.) Naud., leaf blades 8–13 mm long with evident secondary veins on the lower surface, and a glabrous hypanthium. In distinguishing the various species of *Comolia,* Cogniaux emphasized the presence or absence of a dorsal stamen connective calcar; this character, however, may prove of little significance, at least in the species grouped around *C. leptophylla* (Bonpl.) Naud., *C. veronicaefolia* Benth. (including in R. O. Williams' interpretation also *C. lythrarioides,* and probably *C. amazonica* Cogn.) and *C. berberidifolia.* As interpreted up to now, the generotype, *C. berberidifolia,* is known only from the original collection which is of uncertain origin. In Sabana de Moyo on the right bank of the Río Orinoco 10 km above the mouth of the Río Ventuari, the common species of *Comolia* in the open savanna is *C. leptophylla* in a depressed form (*Wurdack & Adderley 43687*); the more typical less-branched erect phase of *C. leptophylla* is common in the Edo. Bolívar savannas of the middle Orinoco (*Wurdack & Monachino 39943*). In both of these collections the large stamen connectives are often dorsally calcarate. Sheltered thicket-edge habitats in Sabana de Moyo have a *Comolia* with distinctly trinerved leaf blades and evident secondary nerves, but the habit of typical *C. leptophylla; Wurdack & Adderley 43686* shows both this broad-leaved type and intermediates towards *C. leptophylla.* On the basis of these collections, *C. leptophylla* should probably be regarded as an open-savanna subspecies of *C. veronicaefolia,* but both in turn may be subordinated to *C. berberidifolia* (of which I have seen only the type photograph, Macbride 36179). Among this assemblage, however, the character combination in *C. prostrata* seems sufficient to justify specific recognition.

Comolia ayangannae Wurdack, sp. nov.

Ab omnibus speciebus ovariis 4-locularibus differt foliis lanceolatis bene petiolatis connectivo postice distincte calcarato.

Frutex ad 1 m; rami primum quadrangulati demum teretes et decorticantes petiolis inflorescentiis sepalis extus hypanthiisque modice vel dense setulosi pilis 0.15–0.3 mm longis setulis glanduliferis sparse intermixtis. Petioli 0.7–1.2 cm; lamina 2.5–5 × 1–2 cm lanceolata vel late lanceolata apice anguste acuta basi obtusa membranacea 5-nervata jugis ad basim breviter (0.5–1 mm) coalitis nervis secundariis nervulisque supra invisus subtus inconspicue elevatis et laxe reticulatis, supra et subtus sparse inconspicueque strigulosa pilis 0.1–0.2 mm longis, ad margines inconspicue serrulata dentibus ciliolatis 0.1–0.2 mm altis et 1.5–2 mm inter se distantibus. Panicula racemiformis 3–6 cm longa plerumque 6–9-flora; pedicelli (3–)10–15 mm longi; bracteolae 0.6–0.9 mm longae lanceolatae setulosae ca. 3 mm infra hypanthium insertae persistentes. Hypanthium 4 mm longum; calycis tubus 1 mm longus, lobis 4–6 mm longis anguste lanceolatis intus glabris. Petala 15.5–17 × 9 mm asymmetrice ovato-elliptica apicem versus sparse glanduloso-ciliolata alioqui glabra. Stamina vix dimorphica glabra, filamentis 7–7.5 mm longis, thecis anguste subulatis curvatis. Stamina maiora: thecae 7 mm longae, connectivo 1.3 mm prolongato dorsaliter ad basim cum calcari hebeti-acuto 1.3 × 0.5 mm ventraliter cum appendice bilobata 1.5 mm longa. Stamina minora: thecae 4.2 mm longae, connectivo 0.7 mm prolongato dorsaliter ad basim calcari 0.3 mm longo ventraliter appendice bilobata 0.8 mm longa. Stylus 16 × 0.3 mm; stigma truncatum; ovarium glabrum 4-loculare; capsula immatura 4-valvata.

Type. Leaves thin, brittle, dark above, lighter beneath, calyx green, corolla pink above and near-white beneath, anthers yellow, locally frequent in scrub and low forest on shoulder of east flank of Mt. Ayanganna above Thompson Camp, upper Mazaruni River basin, Pakaraima Mts., British Guiana, alt. 1418–1585 m, 10–11 Aug 1960, *Stephen S. Tillett, Carolyn L. Tillett, & Rufus Boyan 45077* (holotype US 2343860).

The label notes mentioned ''flowers 4- or 5-merous,'' but only one of 40 observable flowers was 5-merous. Technically *C. ayangannae* would key to near *C. stenodon* (Naud.) Triana and *C. latifolia* (Aubl.) Cogn.; the former differs in the rigid shorter-petioled densely glandular-setulose leaves and much smaller stamen-connective appendages, while the French Guiana species, obscurely known since the original description, is a ''hirsute-villose'' species with ''subrotund'' leaves. In stamen form (but not vegetatively), *C. ayangannae* is much closer to several species in Sect. *Comolia,* or to *Acisanthera alsinaefolia* (DC.) Triana. Within *Acisanthera,* placement would technically be in Sect. *Dichaetandra;* the only species of this section, *A. goudotii* (Naud.) Triana, has long aristate ventral connective appendages and is altogether so remarkably like (ex Macbride photographs) *Ernestia ovata* Cogn. that only a reexamination of the Cogniaux-implied ''glabrous'' ovary will establish the correct generic placement of the Goudot material. As for *A. tetraphylla* (Cogn.) Gleason, the capsules of all specimens seen by me are bivalved and therefore the ovary probably 2-celled, implying placement near *A. hedyotidea* (Presl) Triana.

Comolia montana Gleason.

From extensive Chimantá Massif collections, this species seems constantly (albeit weakly) separable from *C. coriacea* Gleason by its glabrous (except for the toral region) hypanthium and young leaf surfaces (except the margins), as

well as by the calyx lobes glabrous on the back. *C. montana* has moderately to densely glandular-puberulous hypanthia, young leaves, and calyx lobes. No other vegetative or reproductive criteria serve for separation. The type sheet of *C. montana* consists of six sprigs, of which the upper three are *C. coriacea* and the lower three (including the holotype) are *C. montana*. The two species are known from the Chimantá Massif by the following collections:

C. coriacea—Wurdack 34171, 34206, Steyermark & Wurdack 627, 722, 740.
C. montana—Steyermark & Wurdack 447, 542, 723, 741.

Mallophyton Wurdack, gen. nov.

Tribus *Tibouchineae*. Pubescentia lanuginosa, pilis tenuibus debilibus. Flores 4-meri. Stamina vix anisomorphica, connectivo basi prolongato incrassato. Ovarium 3-loculare glabrum. Genus monotypicum.

Mallophyton chimantense Wurdack, sp. nov. Fig. 63, a–j.

Frutex 0.1–2 m; ramuli novelli foliis subtus hypanthiis sepalisque densissime lanuginoso-pubescenti, pilis primum rufescentibus demum pallidis; rami teretes demum decorticantes. Folia vix (ad 3 mm) petiolata, 2–4 × 2–3 cm late ovata vel late elliptico-ovata, apice hebeti-obtusa vel rotundata basi vix (2–5 mm) cordata crasse rigideque coriacea convexa supra ferrugineo-lanuginosa mox glabrata, 5–7-nervata nervis primariis lateralibus supra invisis subtus crasse elevatis nervis secundariis tertiariisque supra invisis subtus vix evolutis marginibus recurvatis. Flores in dichasia triflora sessilia terminalia aggregati. Hypanthium (ad torum) 5 × 4–4.5 mm; calycis tubus 0.7 mm altus, lobis 2.5 mm longis subulatis anguste acutis basi valde remotis. Petala 16–17 × 15–16 mm asymmetrice obovata apice truncata glabra eciliata. Filamenta 9 vel 8–8.5 mm longa glabra; antherarum thecae 4.2 vel 3.9 mm longae, connectivo basi 1.1 vel 0.7 mm prolongato ventraliter ad basim 1 × 0.8 mm obovato vel oblongo-obovato. Stylus 15 × 0.4 mm glaber; stigma punctiforme. Capsula trivalvata; semina cochleata inconspicue denseque muriculata.

Type. Petals deep pink, anthers yellow, frequent in swampy depression in savanna along east branch of headwaters of Río Tirica, central section of Chimantá Massif, Edo. Bolívar, Venezuela, alt. 2100 m, 12 Feb 1955, *J. A. Steyermark & J. J. Wurdack 766* (holotype US 2342408). Paratypes: VENEZUELA, Edo. Bolívar. Chimantá Massif: savanna below summit of western escarpment, Torono-tepuí, alt. 2100 m, *Steyermark & Wurdack 679;* east-central portion of summit of Apácara-tepuí, alt. 2150–2200 m, *Steyermark 75882.*

The tepuí species of *Comolia* have similar stamens, but qualitatively very different pubescence and a two-celled ovary. The species of *Acisanthera* Sect. *Acisanthera* have 3-locular ovaries, but predominantly 5-merous flowers with definitely bilobed ventral connective appendage and non-woolly pubescence; the species are herbaceous or scarcely woody.

Pachyloma pusillum Wurdack, sp. nov. Fig. 66, a–c.

A congeneribus differt foliis uninervatis basi attenuatis.

Suffrutex ad 25 cm altus non vel vix ramosus; caulis glaber vel primum sparsissime glanduloso-setulosus demum glabratus. Folia sessilia vel vix (ad 1 mm) petiolata glabra 2.5–5.5 × 0.3–0.7 cm lanceolato-elliptica apice basique acuta coriacea (i.s. longitudinaliter striata) uninervata ad margines vix incrassata integra. Flores terminales solitarii vel terni non pedunculati; pedicelli ad anthesim ca. 2 mm longi demum ad 10 mm elongati ad medium bibracteolati (bracteolis 2–3 mm longis lanceolatis) bracteolis hypanthiisque sparse glanduloso-setulosi. Hypanthium 5 mm longum; calycis lobi ca. 1 mm longi ovati glanduloso-ciliolati. Petala ca. 9 × 4.5 mm elliptica apice acuta apicem versus sparse glanduloso-ciliolata. Stamina isomorphica; filamenta 7 mm longa glabra; antherarum thecae 4 mm longae, connectivo basi 1.8 mm prolongato ventraliter cum appendice bilobulata 0.8 mm longa lataque postice ad basim ipsam cum cauda 1.8 mm longa. Stylus ca. 1 cm exsertus; ovarium apice sparse glanduloso-puberulum.

Type. Flowers pink, rare in Savanna No. 3, northwest base of Cerro Yapacana, Río Orinoco, Terr. Amazonas, Venezuela, alt. 125 m, 17 Mar 1953, *Bassett Maguire & John J. Wurdack 34516A* (holotype NY). Paratype. Same locality, *Maguire, Cowan, & Wurdack 30564* (fruiting).

While the material cited is very scanty, the vegetative distinctness of *P. pusillum* from the other congeners is ample for diagnosis. Only a single flower (not dissected) is available on the unicate holotype; the petal and anther dimensions were derived from dropped parts of this flower. The other species of *Pachyloma* have 3–5-nerved leaf blades; the dried leaves of *P. pusillum* are longitudinally ridged but without any lateral primary veins.

Acanthella sprucei Hook. f. in Benth. & Hook. Gen. Plant. **1**: 749. 1867.

A. montana Gleason. Mem. N. Y. Bot. Gard. **8**: 134. 1953.

The internodal development, leaf, and seed characters cited for differentiation of the Sipapo collections from the lowland species all may be found exactly the same in Esmeralda (topotypical for *A. sprucei*) and other specimens. Until adequate cumbre flowering material demonstrates conclusive differences, I shall regard *A. montana* as a synonym. The species has also been collected (fruiting) on Cerro Yutaje (*Maguire & Maguire 35142*) and Cerro Guanay (*Maguire, Phelps, Hitchcock, & Budowski 31653, 31734*); its known range is from the Río Parguaza in Edo. Bolívar (Venezuela) to the Río Caquetá in Colombia. Students since Cogniaux have followed him in using a Velloso epithet [*Acanthella conferta* (Vell.) Cogn.] for the Orinoco-Rio Negro species. Patently this is ridiculous, as Velloso's scanty description of a 5-merous glabrous-stemmed herbaceous Melastome from Rio de Janeiro would imply. At present, I am skeptical about any attempts to identify the Velloso names in the *Melastomataceae;* in any event *Melastoma conferta* Vell. (if even *Melastomataceae*) is probably a microlicioid species, perhaps a *Cambessedesia,* and certainly not the same as *Spruce 3222.*

There also seems to be no real distinction between *A. plicata* Gleason and *A. pulchra* Gleason; the young leaves are plicate on *Steyermark 58438* (US) and *Wurdack & Monachino 41024* as in *A. plicata,* with older leaves being flat; the seed size is apparently correlated with the capsule age. The prior name is *A. pulchra.*

Adelobotrys saxosa Wurdack, sp. nov.

A. fruticosae Wurdack affinis sed foliis subtus glabratis inflorescentia expansa hypanthio vix striguloso calycis lobis interioribus minoribus rotundatis.

Arbor gracilis 2–8 m alta; rami robusti primum petiolis inflorescentiis

hypanthiisque sparse strigosi (pilis debilibus gracillimis) mox glabrati. Petioli 1.5–3 cm; lamina (5–)7–15 × 3–7 cm elliptica apice obtusa et minute (ad 2 mm) mucronata basi obtusa coriacea, supra et subtus primum sparse strigulosa (pilis gracillimus) mox (nervis primariis subtus exceptis) glabrata 5- vel sub-7-nervata nervis secundariis parce distinctis tertiariis non evolutis, ad margines densissime ciliata pilis gracilibus primum ravis demum fuscis. Inflorescentia 10–20 cm longa racemiformis angusta verticillato-interrupta verticillorum singulorum floribus 4–8; pedicelli 2–5 mm longi; flores 5(–6)-meri. Hypanthium (ad torum) 8–9 mm longum; calycis tubus 2 mm longus, lobis interioribus ca. 1–1.5 × 3 mm obverse ellipticis, dentibus exterioribus anguste acutis ca. 1 mm eminentibus. Petala 22–25 × 11–15 mm asymmetrice obovata apice hebeti-obtusa. Stamina dimorphica. Stamina maiora: filamenta 10–11 mm longa; antherae 10 mm longae curvatae subulatae, connectivo basi dorsaliter dente acuto 0.7–1 mm alto et appendice adscendenti truncata 3.5–4 mm longa. Stamina minora: filamenta 11.5–12 mm longa; antherae 5.5–6.1 mm longae, connectivo basi dorsaliter dente acuto ca. 0.3 mm alto et appendice adscendenti 3–4 mm longa. Stylus 10.5–13 × 1.3–0.5 mm; stigma punctiforme; ovarium 3-loculare glabrum apice in collum 0.7 mm altum protractum.

Type. Petals pink, frequent on slopes of Piedra Arauicaua, Río Yatua, Terr. Amazonas, Venezuela, alt. 150–500 m, 15 Jul 1959, *J. J. Wurdack & L. S. Adderley 43151* (holotype US 2342634). Paratypes. VENEZUELA, Terr. Amazonas. Río Yatua: Piedra Arauicaua, *Maguire, Wurdack & Bunting 37473*. *Maguire, Wurdack & Maguire 41610*. Río Siapa: crystalline dome on right bank of river just below Raudal Gallineta, alt. 300–700 m, *Wurdack & Adderley 43543*.

A. fruticosa (now known at anthesis by the topotypical *Maguire, Wurdack, & Keith 41798*) has lower leaf surfaces and hypanthia densely and persistently fine-strigulose, sessile or scarcely (to 1 cm) pedunculate inflorescences, and ovate interior calyx lobes 2.5–3 mm long. *A. barbata* Triana, apart from the distinctive lower leaf surface malpighian hairs, has inflorescences usually trifurcate from at or near the base, as well as densely pubescent hypanthia. The Peruvian *A. macrantha* Gleason, described as arborescent, has thinner larger acute leaf blades with prominent secondary nerves, as well as flower verticels on lateral branchlets and non-emergent external calyx teeth. The holotype (K) of *A. rotundifolia* Triana, from forests along the Río Casiquiare, has been examined; that species apparently has a vining habit, branched inflorescences with less robust axes, finer marginal leaf hairs, and (judging from the fruit) much smaller flowers. *A. saxosa* is abundant on the piedra slopes at both known localities, but is definitely a rainy-season flowerer; the Arauicaua paratypes are in young (Sep 27) and old (Feb 3) fruit.

Phainantha maguirei Wurdack, sp. nov. Fig. 65, a–h.

P. laxiflorae (Tr.) Gleas. affinis sed foliis subtus nervis primariis exceptis glabris staminum maiorum connectivis prolongatis.

Frutex scandens; ramuli petiolis inflorescentiisque sparse setulosi demum glabrati. Folia pseudoalternata, uno non evoluto; petioli 0.7–1.5 cm; lamina 7–10 × 3–5.5 cm ovato-elliptica apice breviter graditerque acuminata basi vix (ad 2 mm) cordata rigida, supra glabra, subtus in nervis primariis sparsissime setulosa in superficie glabra, 5-nervata jugo exteriore marginali nervulis obscuris, ad margines apicem versus distanter ciliolato-serrulatis ciliis caducis. Panicula 8–12 cm longa terminalis saepe e basi inaequaliter biramosa; flores 4-meri

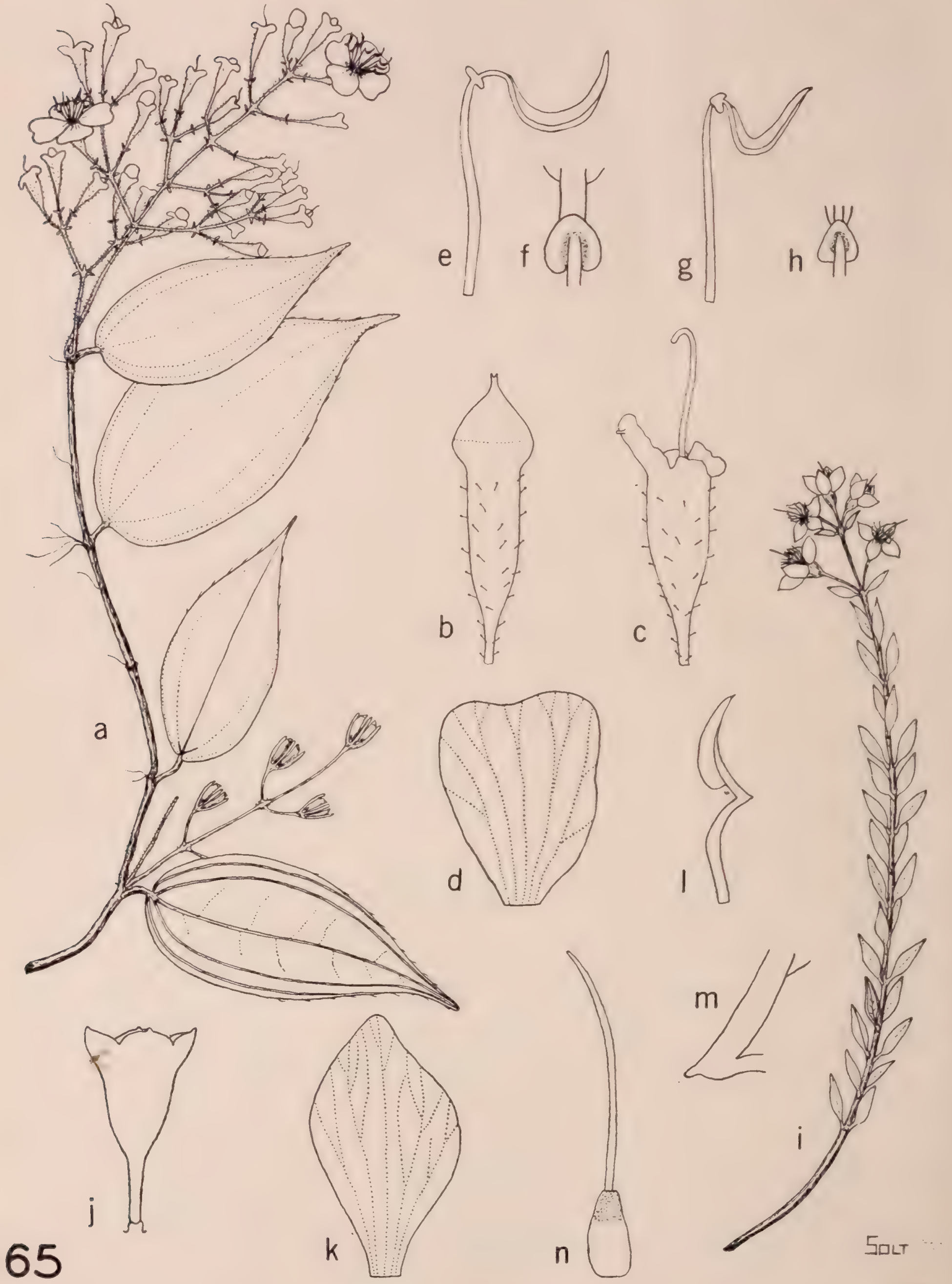


FIG. 65. a–h, *Phainantha maguirei*. a, habit, × 0.5. b, flower bud, × 2.5. c, hypanthium and calyx, × 2.5. d, petal, × 2.5. e, large stamen, × 5. f, large stamen connective, dorsal view, × 10. g, small stamen, × 5. h, small stamen connective, dorsal view, × 10. i–n, *Graffenrieda steyermarkii*. i, habit, × 0.5. j, hypanthium and calyx, × 4. k, petal, × 4. l, stamen, × 4. m, stamen connective base, × 20. n, pistil, × 4.

pedicellis 0.5–1.5 cm longis sparse glanduloso-setulosis minute bibracteolatis. Hypanthium (ad torum) 6.5–9 mm longum basim versus sparse caduceque glanduloso-setulosum; calyx (apiculo excluso) 2.7–3 mm altus apiculatus (apiculo ca. 0.8–1 mm alto ad apicem vix diviso) calyptriformis ad anthesim ca. 1 mm supra torum dehiscens. Petala 11–15 × 8–12 mm late asymmetriceque obovata apice vix emarginata glabra. Stamina glabra dimorphica; filamenta 5.5–6 mm. Stamina maiora: antherarum thecae 4–8.5 mm longae subulatae curvatae, connectivo basi 0.8–1 mm prolongato appendice cordiformi 0.5–1.5 × 0.5–1.5 mm ventraliter vix bilobulata. Stamina minora: antherarum thecae 3.5–4.5 mm longae subulatae valde curvatae, connectivo basi 0.3–0.6 mm prolongato appendice triangulari vel cordiformi 0.5–0.8 × 0.5–0.8 mm. Stylus glaber; ovarium 4-loculare.

Type: Vine 3 m, calyx red, corolla white, Río Sarvén near Camp 9, slope forest of Sarvén-tepuí, Chimantá Massif, Edo. Bolívar, Venezuela, alt. 1200 m, 7 Feb 1953, *John J. Wurdack 34321* (holotype US 2342491). Paratypes. VENEZUELA, Edo. Bolívar. Cerro Guaiquinima: woodland along watercourse, ''North Valley,'' alt. 1600–1700 m, *Maguire 33075*. Cerro Venamo: northwest slopes, alt. 1100–1300 m, *Steyermark & Nilsson 155*. Chimantá Massif: northwest shoulder of Abácapa-tepuí, alt. 1400 m, *Steyermark 75165*. BRITISH GUIANA, Pakaraima Mts. Mt. Ayanganna: east flank, alt. 1418–1585 m, *Tillett, Tillett, & Boyan 45101*.

P. laxiflora has slightly plinerved generally larger leaves with the lower surface persistently setulose at anthesis, as well as stamens with connectives not prolonged. The British Guiana collection of *P. maguirei* has considerably (ca. 50–75 per cent) larger flowers than the Venezuelan material, but does not differ qualitatively; the smaller cited floral dimensions are from the Edo. Bolívar specimens.

Graffenrieda irwinii Wurdack, sp. nov.

G. caryophylleae Triana affinis sed ramis subalato-quadrangularibus, petiolis alatis, inflorescentiae bracteis magnis ad anthesim persistentibus.

Rami alato-quadrangulares alis crassis 1–1.5 mm altis cum petiolis inflorescentiis bracteis extus hypanthiisque sparse appresso-furfuracei demum glabrati. Petioli 1.5–2 cm; lamina 12–17 × 4.5–6.5 cm elliptica apice hebeti-acuta basi acuta et usque ad petioli basim anguste decurrens coriacea, trinervata nervis primariis lateralibus 2–3 mm inframarginalibus nervis secundariis 4–6 mm inter se distantibus tertiariis invisis, supra glabra subtus in nervorum primariorum axillis minute barbellato-setulosa et in superficie densissime punctulis minutis pallide flavidis obsita alioqui glabra integra. Panicula 15 cm longa pyramidato-oblonga ad nodos conspicue bracteata; bracteae 25 × 12 mm vel distaliter 10 × 8 mm elliptica vel rotundato-elliptica intus glabrae naviculares certe ad anthesim persistentes. Flores 5-meri sessiles ad ramorum brevium apices glomerati. Hypanthium (ad torum) 5 mm longum; calyx primum ca. 2–2.5 mm altus clausus apiculatus demum in lobos 3–4 irregulariter dehiscens. Petala 12–13 × 7–8.5 mm obovata apice asymmetrice lateque obtusa glabra. Filamenta 6 mm longa; antherarum thecae 5 mm longae curvatae convolutae appendice dorsali 1.3 mm longa acuta. Stylus 9.5 × 0.5 mm glaber; stigma punctiforme; ovarium 3-loculare liberum apice truncatum.

Type: Shrub to 4 m, corolla white, in rocky soil overhanging brink adjacent to Kaieteur Falls, Potaro River, British Guiana, 17 Jan 1954, *H. S. Irwin 117* (holotype US 2143648).

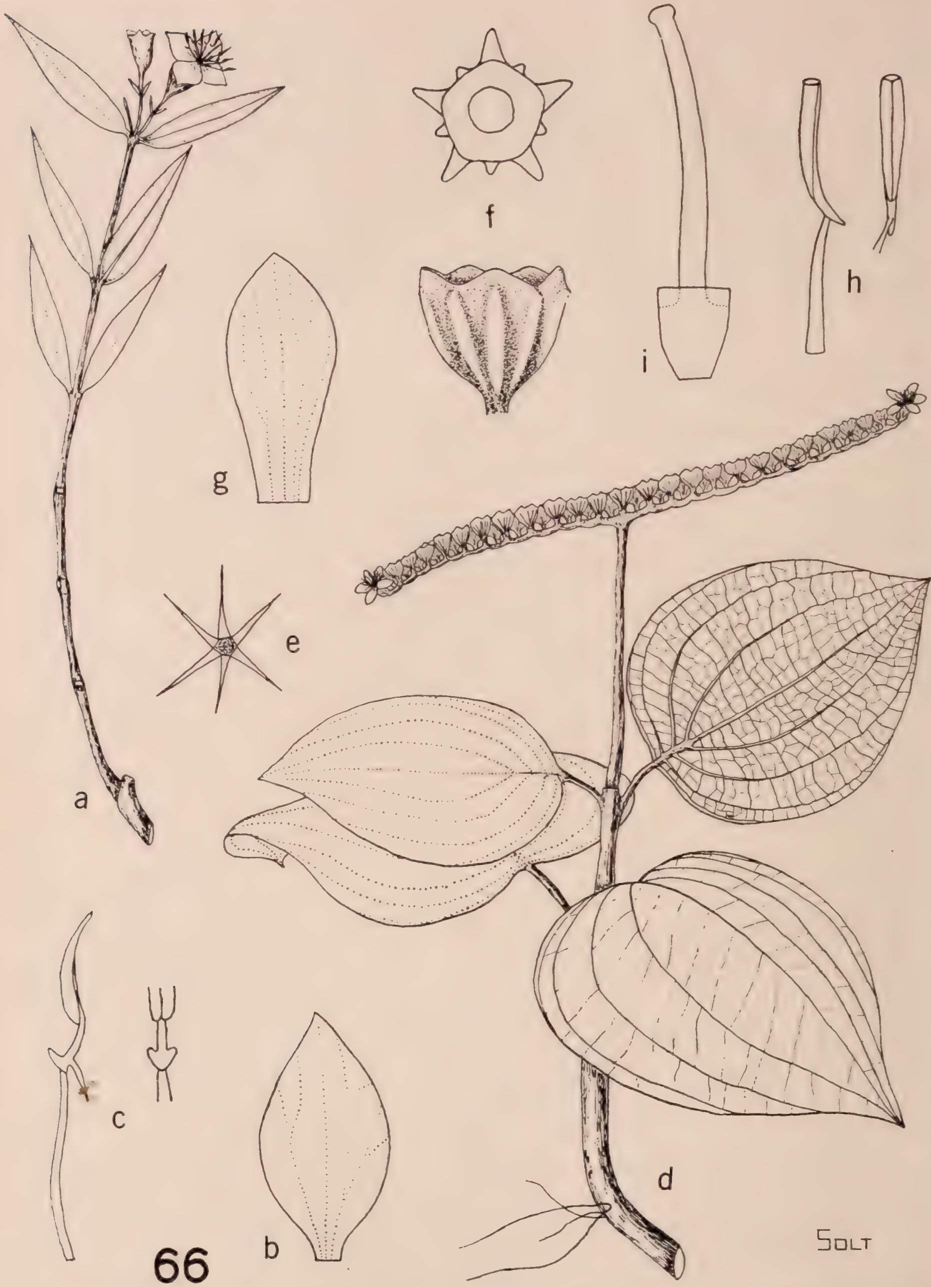


FIG. 66. a–c, *Pachyloma pusillum.* a, habit, × 0.5. b, petal, × 3.5. c, stamen, lateral and ventral (partial) views, × 3.5. d–i, *Maguireanthus ayangannae.* d, habit, × 0.5. e, hair, × 30. f, hypanthium, lateral view and cross-section, × 4. g, petal, × 6. h, stamen, lateral and ventral views, × 6. i, pistil, × 6.

G. caryophyllea has obscurely rounded-quadrate to terete branches, non-alate petioles, and minute deltoid early-caducous inflorescence node bracts about 1 mm long. The flowers of the two taxa are alike. *G. caryophyllea* is apparently to be found on most of the crystalline monadnocks of the upper Río Negro drainage, as well as on the Gran Sabana and in several cumbres (Auyán-tepuí, the Chimantá Massif, Guaiquinima, Duida, and Yutaje). The amorphous lower leaf surface indument varies in amount and persistence, with most (but not all) cumbre collections having the deepest and most persistent. Generally, the cumbre material has slightly smaller flowers than the lower-elevation specimens, but one large Río Parguaza monadnock series (*Wurdack & Monachino 41025*) has slightly smaller flowers than any cumbre number along with quite glabrous foliage. Minute punctulae like those of the leaves of *G. irwinii* may also be seen in the more glabrous collections of *G. caryophyllea* (cf. *Maguire & Maguire 35146*). Triana's and Cogniaux' descriptions of the "4-merous" flowers of *G. caryophyllea* are quite misleading, as examination of an isotype (NY) and the numerous recent collections shows almost exclusively 5-mery.

Graffenrieda polymera Gleason subsp. **neblinensis** Wurdack, subsp. nov.

A subsp. *polymera* differt pedicellis tenuioribus floribus minoribus petalis albidis.

Type. Tree 8 m tall and 6 cm DBH, flowers white and 5-merous, frequent along trail just below north escarpment, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 1850 m, 17 Nov 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42136* (holotype US 2342608). Paratypes. VENEZUELA, Terr. Amazonas. Cerro de la Nablina: just below north escarpment, alt. 1600–1800 m, *Maguire, Wurdack & Bunting 36925, 36992, 37267.*

In subsp. *polymera,* known only from Duida and Parú, the pedicels are 1.5–2 mm in diameter and not well differentiated from the attenuate hypanthium base, the hypanthium plus calyx is 9–11 mm long (Gleason's original hypanthial dimensions included the pedicel length), and the pink-flushed petals are 14–17 mm long. The Neblina subspecies has distinct pedicels 3–5 × 1 mm, hypanthium plus calyx 6–7 mm long, and white petals 9–11 × 7–9 mm. Of 58 buds examined in the various collections of subsp. *neblinensis,* 41 were 5-merous; 11, 6-merous; and 6, 4-merous. The typical subspecies seems predominantly 6-merous.

G. polymera generally has the vegetative and floral features of *G. caryophyllea;* however the calyx of *G. polymera* is not calyptrate, and the bud petals protrude through the truncate (or nearly so) calyx apex as in *Meriania urceolata* Triana. In *G. caryophyllea,* the closed calyx ruptures, as the bud matures, into 2–3 large membranous rather persistent lobes.

Graffenrieda sessilifolia Triana subsp. **cardonae** Wurdack, subsp. nov.

A subsp. *sessilifolia* differt foliis subtus persistenter granuloso-furfuraceis petalis roseis.

Type. "Arbusto de 3 m, flor morada, en la planicie de la cumbre del Auyán-tepuí," Edo, Bolívar, Venezuela, alt. 2100 m, Jan 1949, *F. Cardona 2681* (holotype US 1997693; isotypes NY, VEN). Paratype. VENEZUELA, Edo. Bolívar. Auyán-tepuí: alt. 2200 m, *Tate 1166* (NY).

The differences in the three subspecies of *G. sessilifolia* were noted previously (Mem. N. Y. Bot. Gard. **10**: 110. 1958). Also Gleason had commented (Brittonia

3: 176. 1939) on the persistent lower leaf surface pubescence of the Auyán-tepuí population.

Graffenrieda steyermarkii Wurdack, sp. nov. Fig. 65, i–n.

G. fruticosae Wurdack affinis sed foliis i. s. concoloribus floribus minoribus bene pedicellatis calycis dentibus exterioribus brevioribus connectivi appendice dorsali vix 0.1 mm longa.

Ramuli novelli inflorescentiis hypanthiisque dense rufidulo-furfuracei. Petioli 0.5–2 mm longi; lamina 10–20 × 4–7 mm oblongo-lanceolata apice hebeti-acuta basi acuta rigida concolorata supra glabra subtus sub lente dense resinoso-furfuracea vix (ad 1 mm) 3-plinervata nervis secundariis supra obscuris subtus vix elevatis utrinque 6–7. Inflorescentia 0.8–3 cm pedunculata terminalis; flores per inflorescentiam 3–7 ubique 4-meri pedicellis 2.5–4 mm longis. Hypanthium (ad torum) 2.5 mm longum; calycis tubus 0.9 mm altus, lobis 0.6 × 1.9 mm obverse ellipticis dentibus exterioribus obscure evolutis ca. 0.1 mm eminentibus. Petala 9 × 4–5 mm obovato-elliptica apice hebeti-acuta extus sparse resinoso-papillosa. Filamenta 3–3.5 mm longa; antherarum thecae 3–3.2 mm longae, connectivo basi 0.6–0.9 mm prolongato dorsaliter 0.1 mm calcarato. Stylus 8.5 × 0.3–0.4 mm; stigma punctiforme; ovarium 3-loculare apice dense granuloso-furfuraceum; fructus 3-valvatus.

Type. Shrub 3–5 feet tall, petals white, calyx brown, leaves subcoriaceous, dark green above, yellow pale green below, older stems purple, younger stems castaneous, *Bonnetia* forest on northwestern part of summit of Abácapa-tepuí, Chimantá Massif, Edo. Bolívar, Venezuela, alt. 1825–2000 m, 13 Apr 1953, *J. A. Steyermark 74883* (holotype F 1448602; isotypes NY, US).

G. fruticosa has lower leaf surfaces completely covered with amorphous tawny to pale indumentum, predominantly 5–6-merous scarcely pedicellate 50 per cent larger flowers, external calyx teeth 1.5–2.5 mm long, and dorsal stamen appendage 0.8–1 mm long. *G. steyermarkii* represents an even more extreme reduction in the evolutionary line mentioned in the original description of *G. fruticosa;* the Chimantá species has the smallest dorsal calcar known to me in the genus, the appendage being apparent only on boiled stamens.

Graffenrieda miconioides Naud.

Despite Cogniaux' description of a glabrous ovary for both this species and the dubiously distinct *G. floribunda* Triana, material from Amazonian Colombia (*Schultes & Cabrera 12936, 17576*) according with the type photograph (Macbride 36204), as well as Peruvian material (Klug 3139) determined by Gleason as *G. floribunda,* has furfuraceous ovary apices. Certainly conspecific with the Colombian collections is *Bernardi 1514* (NY), from Caño Auacapa, Río Apácara, Bolívar, Venezuela.

Graffenrieda caudata Wurdack, sp. nov.

G. obliquae Tr. affinis sed foliis apice longe caudatis venis primariis subtus non barbatis calycis lobis minoribus.

Rami novelli foliis inflorescentiisque primum modice granuloso-furfuracei demum glabrati. Petioli 1.5–4.5 cm; lamina (acumine excluso) 7–13 × 4–7 cm elliptica apice per 1.5–3 cm caudato-acuminata basi obtusa fragilis 5-plinervata nervis primariis interioribus 0.5–1.5 cm subalternatim supra basim insertis nervis tertiariis tenuibus laxe reticulatis. Panicula laxe pauciflora terminalis 3–5 cm longa; flores 4-meri breviter (0.5–2 cm) pedicellati. Hypanthium (ad torum) 2.2 mm longum graciliter 8-costatum sparse vel modice resinoso-furfuraceum; calycis tubus 0.9 mm altus, lobis 0.3 mm longis late rotundatis dentibus exterioribus non eminentibus. Petala 3.1 × 1.4–1.7 mm obovato-oblonga apice obtusa vel rotundata. Filamenta 2–2.2 mm longa; antherarum thecae 2.8–3 mm longae arcuato-subulatae, connectivo basi postice calcari 0.1–0.2 mm longo acuto armato. Stylus 6.5 × 0.2 mm; stigma punctiforme; ovarium biloculare superum apice sparse vel modice granuloso-furfuraceum. Fructus maturus ignotus.

Type. Tree 6 m × 5 cm diam, flowers white, occasional in *Cunuria* forest, Membaru-Kurupung trail, Pakaraima Mts., British Guiana, alt. 1000 m, 29 Oct–4 Nov 1951, *Bassett Maguire & D. B. Fanshawe 32404* (holotype US 2342458).

G. obliqua has the axils of the inner pair of primary lower leaf surface veins setulose, leaf blades only gradually and shortly blunt-acuminate, and acute calyx lobes 1–1.5 mm long. Although *G. obliqua* was described by Cogniaux as having 3–4-locular glabrous ovaries, the material available to me shows apically granulose-furfuraceous 2-celled (occasionally 3-celled) ovaries. Both *G. latifolia* (Naud.) Triana and *G. anomala* Triana, with bilocular ovaries, have leaves quite different from *G. caudata*. *Calyptrella littoralis* Gleason is synonymous with *G. anomala;* however, I do not have available at present sufficient material to establish the proper generic disposition of this Choco (Colombia) species.

Neblinanthera Wurdack, gen. nov.

Inflorescentia terminalis. Flores plerumque 6-meri. Stamina plerumque 12; antherarum thecae oblongae apice uniporosae, connectivo non prolongato basi dorsaliter brevissime hebeti-calcarato antice non appendiculato. Ovarium omnino superum plerumque 3-loculare apice trilobulatum et modice glanduloso-setulosum. Capsula trilocularis loculicidaliter dehiscens; semina ignota. Genus monotypicum.

Neblinanthera cumbrensis Wurdack, sp. nov. Fig. 64, f–m.

Frutex 1–2 m; rami obtuse quadrangulati petiolis inflorescentiisque primum modice glanduloso-setulosi pilis ca. 0.1–0.2 mm longis pilis erectis glanduliferis longioribus 1–1.5 mm longis sparse intermixtis demum glabrati. Petioli 2–5 cm longi; lamina 6–14 × 2.5–6.5 cm ovata apice graditer angusteque acuminata basi ad 6 mm cordata rigide membranacea, supra bullato-setulosa bullis basi 0.5–1 mm diam setula glandulifera 0.5–1 mm longa coronatis, subtus densiuscule setulosa pilis plerumque glanduliferis in superficie et venulis ca. 0.3–0.5 mm longis in venis primariis paucis longioribus foveolata venulis prominenter quadrato-reticulatis vix elevatis, 9-vel sub-11-nervata ad margines bullato-ciliata. Panicula 2–7 cm longa e basi trifurcata ramulis ad 2.5 cm longis vix adscendentibus; flores (5–)6(–7)-meri 2–5 mm pedicellati; bracteolae bracteaeque ca. 1 mm longae lineares sparse glanduloso-setulosae ad pedicellorum basim vel medium insertae persistentes. Hypanthium (ad torum) 1.9–2 × 2.5–2.8 mm densiuscule glanduloso-setulosum; calycis tubus 0.2 mm altus, lobis interioribus aegre distinctis 0.1–0.2 mm longis late rotundatis ad margines glandulis sessilibus vel brevi-stipitatis sparse obsitis, dentibus exterioribus 0.5–0.6 mm longis oblongis acutis sparse glanduloso-setuliferis. Petala 3–3.1 × 1.5–1.6 mm obovato-oblonga apice vix emarginata glabra eciliata. Stamina glabra in forma isomorphica in dimensionibus vix anisomorphica; filamenta 2.6–2.7 vel 3.4–3.6 mm longa; antherarum thecae 1.7 vel 2–2.1 mm oblongae apice cum poro 0.2 mm diam, connectivo basi ventraliter cum loculis coalito dorsaliter calcari 0.1 mm longo truncato. Stylus 4 × 0.5 mm glaber; stigma punctiforme 0.1 mm diam; ovarium oblongum apice cum lobulis 0.5 mm altis. Capsula ca. 5–5.5 mm longa ca. 3 mm e hypanthio eminens, valvis apice per 1.9 mm bifidis extus glanduloso-setulosis intus glabris.

Type. Petals white, anthers orange, occasional on Cañon Grande slope east of Cumbre Camp, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 1600–1800 m, 22 Nov 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42173* (holotype US 2342609). Paratype. Same locality, alt. 1500–1600 m, *Maguire, Wurdack, & Maguire 42537-F*.

The superior ovary and capsular fruit indicate placement either in the *Tibouchineae* or *Merianieae;* unfortunately the dehisced capsules of the type collection retained no seeds. In Cogniaux' key to the *Tibouchineae,* only *Svitramia* and *Chaetolepis* would suggest themselves as allies and both genera differ radically in habit and flower-mery. Among the *Merianieae, Behuria* and *Calyptrella* are somewhat suggestive of *Neblinanthera,* both having several species with 6-merous flowers. *Behuria* differs in the larger acute dorsal connective appendage and large calyx lobes, while *Calyptrella* has a calyptriform calyx limb and pulverulent (when present) pubescence, but a similar protruding capsule. At present I would favor *Calyptrella* as the probable nearest generic relative. The simple glandular pubescence of the Neblina genus generally precludes consideration of other genera of the *Merianieae*. In vegetative aspect, *Neblinanthera* is quite like *Leandra maguirei* or some of the *Clidemia* species with bullate leaves; overall, the appearance and stamens would also suggest the bullulate-pubescent species-group of *Miconia* Sect. *Amblyarrhena* (species 387–398 of Cogniaux' monograph).

Centronia neblinae Wurdack, sp. nov.

C. reticulatae Triana affinis sed hypanthio primum granuloso-furfuraceo mox glabrato.

Arbor 6–12 m; ramuli foliis inflorescentiisque primum dense ferrugineo-furfuracei mox glabrati. Petioli 3.5–8 cm; lamina 15–40 × 6–16 cm obovato-oblonga vel oblonga apice plerumque breviter (1 cm) abrupteque hebeti-acuminata basim versus attenuata (basi ipsa rotundata) rigida, trinervata nervis primariis lateralibus ca. 2 mm inframarginalibus nervulis supra subprominenter denseque elevato-reticulatis subtus creberrime densissimeque elevato-reticulatis. Panicula 10–15 cm longa ramis lateralibus 0.5–2 cm longis dichasia singula vel cymas contractas ferentibus; flores 5-meri cum pedicellis robustis 5–8 mm longis. Gemmae maturae 2.3–2.7 cm longae; calyptra rigida 9–14 mm longa apice per 3–5 mm graditer vel abrupte attenuato-apiculata ad anthesim dehiscens; hypanthium (ad torum) 6.5–8 × 8 mm; calycis tubus supra torum 1.5–2 mm altus. Petala 17–20 × 11–12 mm obovata apice obtusa. Stamina isomorphica; filamenta 10 mm longa glabra; antherarum thecae 8–8.5 mm longae curvatae subulatae, connectivo 0.1–0.3 mm prolongato, appendice dorsali 1.5 mm longa acuta. Stylus 11.5 × 0.7–0.3 mm; stigma punctiforme; ovarium 5-loculare glabrum apice per 1 mm in collum protractum, collo apice brevissime denticulato.

Type. Petals white, frequent along Cañon Grande south-southwest of Cumbre Camp, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 1050–1100 m, 25 Dec 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42507* (holotype US 2342618). Paratype. Same locality data, *Maguire, Wurdack & Maguire 42195.*

Both *C. reticulata* and the more distantly related *C. vaupesana* Wurdack have hypanthia and calyptras setose. The leaf blades of *C. neblinae* (as also *C. reticulata*) are strikingly similar to those of *Graffenrieda rupestris* Ducke; vegetatively *G. rupestris* may be distinguished by the strigose or appressed-setose vegetative buds and immature petiole apices.

Maguireanthus Wurdack, gen. nov.

Tribus *Bertolonieae*. Pubescentia stellata. Flores 5-meri. Stamina isomorphica; antherae oblanceolatae, connectivo ad basim prolongato dorsaliter breviter appendiculato. Ovarium 3-loculare. Genus monotypicum.

Maguireanthus ayangannae Wurdack, sp. nov. Fig. 66, d–i.

Simplicaulis erecta ad 25 cm alta; caulis petiolis laminis inflorescentia hypanthiisque dense stellato-puberulus, pilis pallidis ramulis plerumque 4–6 gracilibus ca. 0.3 mm longis. Folia opposita aequalia; petioli 1.5–5 cm; lamina 8–12 × 6–8 cm ovata apice hebeti-acuta basi plerumque truncata membranacea, supra sparsissime strigulosa pilis simplicibus ad 1 mm longis ad margines undulato-denticulata et ciliolata ciliis simplicibus 0.3–0.4 mm longis et 1–2 mm inter se distantibus pubescentia alioqui stellata, 7-plinervata jugis 1–2 mm et 3–8 mm et 7–19 mm supra basim insertis supra planis et glabris subtus leviter elevatis nervulis laxe (ca. 4 × 4 mm) reticulatis. Pedunculus 2–8 cm longus apice cum ramis duobus recte divaricatis secundifloris 2.5–10 cm longis. Flores 5-meri breviter (ca. 1 mm) pedicellati; hypanthium (ad torum) 2 × 3.5 mm (alis exclusis) 10-alatum alis antesepalis ca. 1 mm et intersepalis ca. 0.3–0.5 mm eminentibus; calycis tubus 1 mm altus, lobis 0.8 × 1.5 mm late triangularibus apice late hebeti-acutis. Petala 5.4–5.8 × 2.3–2.4 mm spathulata apice hebeti-acuta glabra non ciliata. Antherarum thecae 2.3–2.4 mm longae basim versus attenuatae apice 0.5 mm latae poro 0.25 mm diam, connectivo sub thecis ad filamenti insertionem 0.8 mm prolongato dorsaliter cauda 0.3–0.4 mm longa lanceolata hebeti-acuta descendente ornato; filamenta 3–3.1 mm longa glabra. Stylus 6.2 × 0.4–0.6 mm glaber; stigma 0.6 mm diam vix expansum truncatum; ovarium glabrum apice in collum carnulosum 0.4–0.5 mm altum prolongatum. Fructus ca. 5 mm longus; semina 0.6 × 0.25 mm anguste pyramidata imperspicue papillosa.

Type. Herb, flowers white, occasional in creek beds, montane slopes of Mt. Ayanganna, British Guiana, alt. 1000–1500 m, 5–6 Feb 1955, *Bassett Maguire, W. M. C. Bagshaw, & Celia K. Maguire 40579* (holotype US 2342569).

The general aspect of *Maguireanthus,* along with the ventrally exappendiculate stamen connectives, suggests *Bertolonia* or *Salpinga;* neither of these genera shows the relatively long connective prolongation nor the anther shape of the new genus. Although habit variation within *Macrocentrum* is great, the connective prolongation is always much shorter than the dorsal appendage. In both pubescence type and inflorescence, *Maguireanthus* differs from all other *Bertolonieae.*

Tryssophyton Wurdack, gen. nov.

Tribus *Bertolonieae*. Flores 4-meri. Stamina in dimensionibus anisomorphica in forma ut in *Marcetia*. Ovarium 4-loculare superum lobulis membranaceis 4 coronatum. Genus monotypicum.

Tryssophyton merumense Wurdack, sp. nov. Fig. 67, g–k.

Herba simplicicaulis plus minusve glandulis rubris sessilibus praedita; caulis usque ad folia gracilis 5–12 cm. Folia ad caulis apicem vel rare etiam ad caulis medium 10–14-verticillata sessilia vel petiolis alatis 2–4.5 × 0.3–0.5 cm oblanceolata vel elliptico-lanceolata apice late acuta vel obtusa basi anguste acuta tenuiter membranacea, supra sparsissime strigulosa, subtus glabra, ad margines conspicue subremoteque ciliolato-serrulata inconspicue trinervata. Flores solitarii vel geminati glabri; pedunculus nullus (in floribus solitariis) vel 1.5–2 cm longus; pedicelli 8–15 mm longi glabri apicem versus 4-alati ad basim bracteolati, bracteolis 0.5–1 mm longis subulatis mucronulatis. Hypanthium (ad torum) 2.1 × 2 mm leviter 8-costatum; calycis tubus 0.1 mm altus, lobis 1.1–1.3 mm longis subulato-triangularibus anguste acutis. Petala 11 × 6 mm asymmetrice elliptica apice abrupte acuta apiculataque. Filamenta 4.5 vel 3.3 mm longa; antherarum thecae 2.3 vel 1.6–1.7 × 0.5 mm apice vix (0.1 mm) rostratae et minute (0.1 mm diam) uniporosae, connectivo basi thecis coalito et ad 0.55–0.65 × 0.4 mm incrassato ventraliter 0.1 mm bilobulato dorsaliter truncato. Stylus 10 × 0.2 mm; stigma truncatum; ovarium ad anthesim ca. 1 mm altum apice in collum 0.4 mm altum et ad 0.2 mm 4-lobulatum (lobis truncatis) protractum. Fructus maturus ignotus.

Type. Petals 1/2 white with exposed bud surfaces deep pink, anthers yellow, fruiting pedicel translucent green suffused with pink, common on mossy logs in forest, Merume Mountain, Partang River, upper Mazaruni River basin, Pakaraima Mts., British Guiana, elev. 1140 m, 4 Jul 1960, *Stephen S. Tillett, Carolyn L. Tillett, & Rufus Boyan 43988* (holotype US 2343844).

In vegetative habit, *Tryssophyton* is very distinct from all known Bertolonieae and Sonerileae. In Cogniaux' keys, the closest New World relative would be *Bertolonia,* the closest Old World one *Sarcopyramus.* In Brenan's synopsis of the African Sonerileae (Kew Bull. 85–89. 1953), apart from the habit, *Tryssophyton* seems to key to *Gravesia* or *Cincinnobotrys;* both genera have somewhat different stamens. Neither Bakhuizen van den Brink's treatment of Malaysian *Melastomataceae* (Rec. Trav. Bot. Neerl. 40. 1943–45) nor Li's revision of the Chinese genera (Jour. Arnold Arb. 25. 1944) offer any relationship clues. The longitudinally bicolored petals of *Tryssophyton* are like those of *Macrocentrum pusillum* Gl. and *M. glandulosum* Gl. I do not believe that great importance should be attached to the 4-celled ovary of *Tryssophyton,* since both paucity of material and difficulty of dissection have prevented accurate knowledge of the constancy of 3-celled ovaries in the New World Bertolonieae; my own dissection notes on *M. pusillum* and *M. gracile* Wurdack, as well as Dr. Gleason's dissection notes on *M. fruticosum* Gl., indicate the occurrence of 2- or 4-celled ovaries. In any event, both the whorled leaves and *Marcetia*-like stamens set *Tryssophyton* apart from other Bertolonieae.

Macrocentrum brevipedicellatum Wurdack, sp. nov.

M. vestito Sandw. affinis sed floris fructusque pedicellis brevioribus.

Herba pusilla ad 12 cm alta; ramuli petiolis foliisque modice breviterque setosi pilis gracilibus simplicibus ca. 1–1.3 mm longis. Folia membranacea in quoque jugo disparilia uninervata ciliata integra vel indistincte crenulato-serrulata; folia maiora 4–7 mm petiolata, lamina 1–2.7 × 0.6–1.4 cm elliptica vel vix obovato-elliptica apice obtusa vel rotundata basi late acuta; folia minora 1–2 mm petiolata, lamina 2–5 × 2–4 mm orbiculari vel late ovata. Flores 4-meri

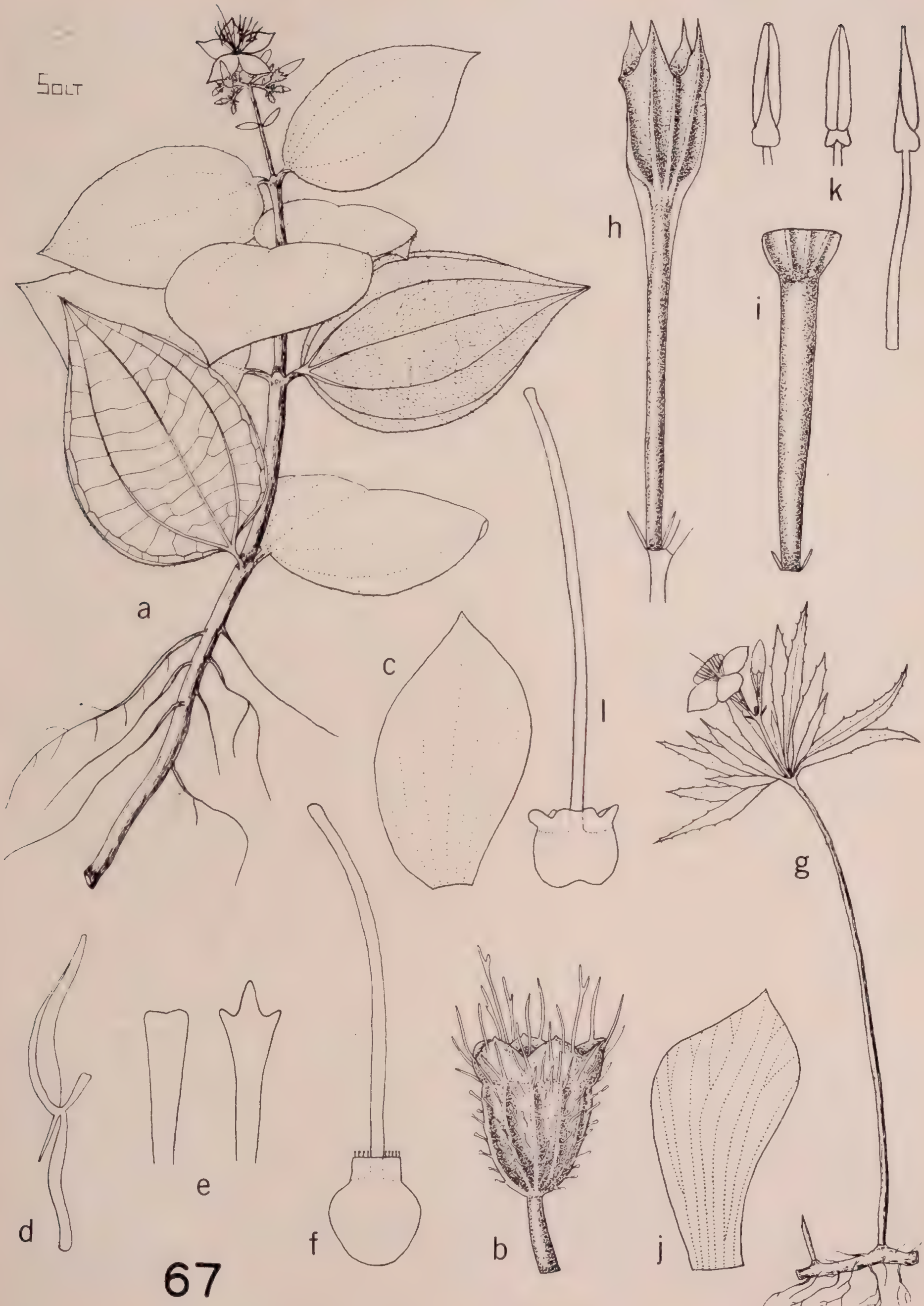


FIG. 67. a–f, *Boyania ayangannae.* a, habit, × 0.5. b, hypanthium and calyx, × 6. c, petal, × 3. d, stamen, × 6. e, ventral stamen connective appendages, × 20. f, pistil, × 6. g–k, *Tryssophyton merumense.* g, habit, × 0.5. h, hypanthium and calyx, × 6. i, young fruit, × 2.5. j, petal, × 3. k, stamen, dorsal, ventral, and lateral (complete) views, × 6.

in ramulis terminales (in fructu demum laterales) plerumque 1–2; pedicelli ad anthesim 1.5–2.5 mm longi demum (in fructu) 2–3 mm longi hypanthio sparse glanduloso-setulosi ad basim inconspicue bracteolati. Hypanthium (ad torum) 2 mm longum leviter 8-costatum; calycis tubus 0.5 mm altus, lobis 1–1.2 × 2 mm obellipticis apice rotundatis ad margines brevissime glanduloso-setulosis extus sparse vel modice setulosis et tuberculo brevi non eminenti armatis. Petala 4.5–5 × 1.5–1.8 mm oblonga apice hebeti-acuta et cum setula glandulifera (glandula caduca) 0.5 mm longa praedita. Stamina isomorphica; filamenta 2.1 mm longa; antherarum thecae 1.9 mm longae anguste oblongae, connectivo 0.6 mm prolongato, appendice dorsali filiformi acuta 0.8 mm longa. Stylus 5 × 0.15 mm; stigma truncatum; ovarium glabrum 3-loculare apice vix (0.2–0.3 mm) depressum et inconspicue trilobatum. Fructus hypanthium ca. 4 mm longum; semina 0.6–0.7 × 0.25 mm pyramidata recta inconspicue striata et apicaliter tuberculata.

Type. Buds pinkish white, locally frequent on mossy logs near Base Camp above Rio Caruai, slope forest of Tirepón-tepuí, Chimanta Massif, Edo. Bolívar, Venezuela, alt. 1100 m, 1 Jan 1953, *John J. Wurdack 34018* (holotype US 2342481). Paratypes. VENEZUELA, Edo. Bolívar. Gran Sabana: km 105–118 between El Dorado and Sta. Elena, *Foldats 12841* (VEN); headwaters of Río Venamo on northern slopes of Cerro La Danta NW of Cerro Venamo, elev. 1040–1060 m, *Steyermark & Nilsson 1*. BRITISH GUIANA, Pakaraima Mts. Merume Mountain: Partang River, alt. 1140 m, *Tillett, Tillett, & Boyan 43951.*

M. vestitum has pedicels 1.8–2 cm long. Another relative, *M. minus* Gleason, has similar short pedicels, but generally smaller leaves which are glabrous or very sparsely strigulose marginally on the upper surface and glabrous except for a very few setae along the midvein on the lower surface; the petals lack a terminal seta. Both relatives are distinguishable vegetatively from *M. brevipedicellatum* by the large pale pustular "dots" (ca. 0.3 mm diam) on the lower leaf surface; the minute white dots of *M. brevipedicellatum* are only 0.05 mm diam.

Macrocentrum anfractum Wurdack, sp. nov.

M. gesneriaceo Sandw. et *M. minori* Gleason affinis sed petalis apice glanduloso-setosis.

Herba 5–12 cm alta vix decumbens vel adscendens ubique glandulis sessilibus primum rubris demum nigrescentibus sparse obsita; caulis gracilis anfractus quadrangulatus ad angulos sparse glanduloso-setulosus pilis ad 1 mm longis vix adscendentibus. Folia ut videtur alterna unum paris inconspicuum abortivum appressum glanduloso-setulosum 0.5–1 mm longum in nodis alternans; folia evoluta cum petiolo glabro 1–2 mm longo, lamina 1.3–3.5 × 0.5–0.7 mm lanceolata apice anguste acuta basi acuta tenuiter membranacea uninervata nervis lateralibus aegre evolutis supra pilis inframarginalibus interdum glanduliferis exceptis glabra subtus in superficie centrali glabra vel sparsissime glanduloso-strigulosa marginem versus sparse glanduloso-strigulosa ubique modice elliptico-punctata punctis ca. 0.3 mm longis primum albidis demum nigrescentibus ad margines incurvo-ciliolata pilis ca. 1 mm longis interdum glanduliferis. Flores 4-meri in foliorum abortivorum superiorum axillis solitarii vel bini primum terminales demum laterales; pedicelli ca. 1 mm longi. Hypanthium calycis tubum includens 3 mm longum apicem versus (circum torum) sparse glanduloso-setulosum; calycis lobi 1 × 1.5 mm obverse elliptici apice

rotundati extus sparse glanduloso-setulosi et infra apicem minute unituberculati ad margines dense cum glandulis sessilibus obsiti. Petala ca. 6 mm longa apice setula unica glandulifera ca. 0.4 mm longa armata. Filamenta ca. 3 mm longa; antherarum thecae ca. 2 mm longae, appendice dorsali descendente ca. 0.8 mm longa. Stylus ca. 5 × 0.2 mm; stigma truncatum; ovarium non visum; fructus pedicellum indistinctum includens 6–7 mm longus; capsula trilocularis apice trigona et vix exsculpta.

Type. Leaves green above, below bright red with white margin and midrib, seen only once on wet mossy rock at Porkknocker Camp 2 on Partang River about 19 km above mouth, upper Mazaruni River basin, Pakaraima Mts., British Guiana, alt. 625 m, 28 Jun 1960, *Stephen S. Tillett, Carolyn L. Tillett, & Rufas Boyan 43929* (holotype NY; isotype US).

All floral measurements were taken dry, the one flower of the collection not being dissected. The sympodial zigzagging of the upper stem is more pronounced in *M. anfractum* than in its near relatives, the angles formed being about 125°–140°. *M. anfractum* seems intermediate between *M. gesneriaceum* and *M. minus*, having the pseudo-alternate leaves of the former and the gland-tipped cauline hairs of the latter; it approaches *M. gesneriaceum* (with elliptic to oblong-elliptic leaves) closer in foliage. Both relatives have esetulose petals. The group of caulescent pubescent 4-merous species may be keyed as follows:

1. Leaf blades above evenly pubescent.
  2. Pedicels 8–20 mm long; leaf dots 0.3 mm diam. *M. vestitum.*
  2. Pedicels 1.5–3 mm long; leaf dots 0.05 mm diam. *M. brevipedicellatum.*
1. Leaf blades above glabrous or pubescent only near margins.
  3. Petals tipped with a glandular seta. *M. anfractum.*
  3. Petals esetulose.
    4. Internodes incurved-setulose.
      5. Petioles incurved-setulose; leaf blade densely incurved-ciliolate to the base. *M. gesneriaceum.*
      5. Petioles glabrous; leaf margins sparsely ciliolate on apical 1/2 only. *M. minus.*
    4. Internodes glabrous.
      6. Hypanthium outside setulose at torus and on wings below torus. *M. rubescens.*
      6. Hypanthium outside setulose only at the torus.
        7. Leaf blade length/width ratio 2–2.3; petals 12–14 mm long. *M. anychioides.*
        7. Leaf blade length/width ratio 3–4.5; petals 5.5 mm long. *M. maguirei.*

Macrocentrum droseroides Triana.

Hitherto known only from the eastern sandstone area, this delicate species has now been collected in Cañon Grande on Cerro de la Neblina (*Maguire, Wurdack, & Maguire 42234, 42517*). The western population is distinguishable qualitatively only by the presence of a caducous short glandtipped apical seta on each petal. Quantitatively, the Neblina plants are generally more robust (the leaf blades up to 5 × 2 cm) with sparsely glandular-setulose peduncles and hypanthia; in all these characters, however, there is overlapping with the eastern population.

Macrocentrum neblinae Wurdack.

In a geographic reversal of the above-cited discovery of *M. droseroides*, *M. neblinae* was recently collected by the Oxford 1959 British Guiana expedition in the Potaro River Valley (*No. 145*). The leaf blades in the eastern material are slightly more elliptic than in the Neblina collections, but otherwise there is no obvious differentiation. Both the above-cited examples show that some species of *Macrocentrum* are much more extensively distributed than previously indicated. The best-collected of the widespread species is *M. glandulosum* Gleason, known from the western Venezuelan sandstone area eastward to Cerros Venamo and Uei (*Steyermark & Nilsson 317, 445*) in extreme southeastern Estado Bolívar (and certainly to be expected on the Kaieteur Plateau in British Guiana).

Boyania Wurdack, gen. nov.

Tribus *Bertolonieae* sensu Cogniaux. Flores 5-meri. Stamina isomorphica; connectivum basi antice 1-appendiculatum postice appendice plerumque caudiformi descendenti instructum; ovarium superum 5-loculare. Genus monotypicum.

Boyania ayangannae Wurdack, sp. nov. Fig. 67, a–f.

Herba suffruticosa simplicicaulis vel vix ramosa 15–50 cm alta; caulis primum dense glandulis sessilibus vel vix stipitatis rubris obsitus tarde glabratus. Petioli 1–1.5 cm longi lateraliter dense setulosi pilis laxis 0.5–1 mm longis, nodis interpetiolaribus membrana elliptica ca. 2 mm alta stipuliformi caduca instructis; lamina 5–12 × 3–6 cm late ovato-elliptica apice late acuta basi obtusa vel rotundata membranacea, supra sparsissime vel modice strigulosa pilis laxis 0.5–1 mm longis, subtus in superficie sparse et in venis modice cum glandulis sessilibus clavatis obsita in venis primariis sparse glanduloso-setulosa alioqui glabra, 5-nervata jugo marginali tenuiore venulis laxe reticulatis, ad margines inconspicue undulato-serrulata et distanter ciliolata dentibus ca. 2–2.5 mm inter se distantibus. Inflorescentia 2–3 cm pedunculata, pedunculo glabro circum medium bibracteato bracteis 4–9 mm longis strigulosis trinervatis; ramuli plerumque 4 verticillati divaricati 3–5 cm longi glabri floribus 3–5 secundis; bracteolae ca. 2 × 1 mm elliptico-obovatae glabrae ad margines vix erosae ad pedicelli basim insertae; pedicelli 3–5 mm longi basim versus glabri ad apicem sparse laxo-setulosi. Hypanthium (ad torum) 2.1–2.5 × 2.3–2.4 mm dense vel modice pilis fragilibus laxis glanduliferis basi incrassatis ad 1.5 mm longis obsitum vix 10-costatum; calycis tubus 0.4–0.5 mm altus, lobis obverse ellipticis apice rotundatis et 0.1 mm unimucronulatis extus tuboque dense pilis laxis fragilibus plerumque non glandulosis interdum apicem versus paucibarbellatis 1.5–3.5 mm longis ornatis. Filamenta 2.5–3 mm longa glabra; antherarum thecae 3.4–4 mm longae subulatae minute uniporosae, appendice dorsali 0.8–1.2 mm longa, appendice ventrali 0.8–1 × 0.2–0.4 mm distaliter vix expansa et emarginato-truncata vel trilobulata. Stylus 8–9 × 0.25 mm glaber; stigma truncatum; ovarium apice in collum 0.8 mm altum marginaliter dense brevissimeque glanduloso-setulosum circum stylum protractum. Fructus ignotus.

Type. Herb, leaves medium green above and whitish green beneath, calyx red, corolla white, infrequent on rotting logs in talus forest along northeast side of Mt. Ayanganna, upper Mazaruni River basin, Pakaraima Mts., British Guiana, alt. 800–900 m, 16 Aug 1960, *Stephen S. Tillett, Carolyn L. Tillett, & Rufas Boyan 45152* (holotype US 2343864). Paratypes. *BRITISH GUIANA,* Pakaraima Mts. Mt. Ayanganna: talus forest slopes on northeast side, alt. 800–915 m, *Tillett, Tillett, & Boyan 45000, 45151.* Membaru-Kurupung Trail: rocks in gorge, alt. 1000 m, *Maguire & Fanshawe 32405.*

All of the previously described genera and species of Bertolonieae have, as far as is known, 2–4-celled ovaries. *Boyania* would key otherwise to *Diplarpea* (with long calyx lobes and oblong anthers with a short blunt dorsal calcar) or to *Monolena* (with glabrous hypanthia and connectives merely tuberculate dorsally). Probably *Boyania* will serve to emphasize the union of the New World Bertolonieae with the Old World Sonerileae; the intertribal hybrids of horticultural literature have tainted the traditional division between the tribes, although I have never seen such hybrids from accurately-named parents. None of the 5-merous Old World genera treated by Cogniaux and subsequent taxonomists seems to have the floral character combination seen in *Boyania* of completely superior ovary without hypanthial septs and subulate anthers with large dorsal and ventral appendages. Although the fruit of *Boyania* is unknown, the general generic relationship seems quite certain because of the habital and pubescence similarities. Of the Tibouchineae, only *Ernestia,* with bilobed ventral connective appendage, 3–4-celled ovary, and quite different pubescence, would at all conform as a possible relative. *Boyania* commemorates the extensive field work performed by Jonah and Rufas Boyan for the British Guiana Forestry Department and The New York Botanical Garden through many years. Two of the three sheets of *Tillett et al. 45000* show nearly glabrous upper leaf surfaces, while all other specimens (including the type number) have moderately pubescent upper blade surfaces; more collections are needed to evaluate this feature.

Platycentrum clidemioides Naud.

Leandra hylophila Gleason, Bull. Torrey Club **68**: 246. 1941.

There are no specific differences between the Putumayo and Trinidad collections of this species; the misleading ''ovary 2/3-inferior'' of Gleason's original description was actually a misprint of ''ovary 2/5-inferior,'' as shown in the original dissection notes. Examination of the Colombian specimens shows a nearly superior ovary. The species has also been collected in Venezuela on the slopes of Cerro de la Neblina at alt. 1000 m (*Maguire, Wurdack, & Bunting 37357*).

Leandra chimantensis Wurdack, sp. nov.

L. procumbenti Ule affinis sed foliis proportionaliter vix angustioribus ramorum et foliorum subtus pilis barbellatis inflorescentiis hypanthiisque densiuscule glanduloso-setulosis.

Rami teretes basim versus radicantes novelli petiolis inflorescentiisque modice vel dense setulosi pilis flexuosis remote barbellatis vetustiores glabrati. Petioli 4–7 mm; lamina 2–5 × 1.2–2.5 cm elliptica apice late acuta vel anguste obtusa basi rotundata rigida, supra primum in nervis primariis sparsissime barbellato-setulosa mox glabrata, subtus in nervis primariis secundariisque primum sparse barbellato-setulosa demum glabrata, 3-nervata (jugo exteriori inframarginali tenui neglecto) nervis nervulisque supra anguste impressis subtus vix elevato-reticulatis, apicem versus remote ciliolato-serrulata. Panicula 2–6 cm longa oblonga pauciflora sparse setis i.s. nigris glanduliferis ca. 1 mm longis obsita; flores 4-meri plerumque 0.5–3 mm pedicellati; bracteolae 1 × 0.2–0.3 mm lanceolatae setulosae ad hypanthii basim insertae persistentes. Hypanthium (ad torum) 2 mm longum sparse vel modice barbellato-setulosum et sparse glanduloso-setulosum; calycis tubus 0.1 mm longus, lobis interioribus 0.5 mm longis ovatis apice obtusis sparse ciliolatis, dentibus exterioribus crassiusculis setuliferis interiores aequantibus. Petala 3.5 × 1.4 mm oblongo-lanceolata apice acuta et mucronulata glabra. Filamenta i.s. 2 mm longa glabra; antherarum thecae i.s. 2.2 mm longae oblongae minute porosae, connectivo non prolongato sed dorsaliter ad basim per 0.5 mm crasse elevato. Stylus 5.5 × 0.3–0.2 mm; stigma vix ex-

pansum 0.25 mm diam; ovarium 3-loculare 1/2-inferum glabrum apice in collum 0.3 mm altum circum stylum protractum. Semina pyramidata 1.1 × 0.6 mm laevia.

Type. Leaves dark green above, pale green below, coriaceous, the veins finely and deeply impressed above, hypanthium deep maroon, petals and filaments rose, fruit blue, climbing in *zanjones* bordering rocky savanna above Upper Falls, between meanders of west branch of Río Tirica headwaters, central section, Chimantá Massif, Edo. Bolívar, Venezuela, elev. 2150 m, 17 Feb 1955, *J. A. Steyermark & J. J. Wurdack 924* (holotype US 2342410). Paratypes. VENEZUELA, Edo. Bolívar. Chimantá Massif: Torono-tepuí, alt. 2150–2180 m, *Steyermark & Wurdack 645, 1051 p.p.;* Apácara-tepuí, alt. 2150–2200 m, *Steyermark 75909.*

L. procumbens has ovate-elliptic leaf blades with five distinctly developed primary nerves (the outer pair plainly visible on the upper surface and 1–1.5 mm from the margins), as well as eglandular non-barbellate hairs throughout; originally known only from Roraima, the species also occurs on Chimantá-tepuí (*Steyermark & Wurdack 1051 p.p.*), growing in the same crevasses as *L. chimantensis.* Ule assigned *L. procumbens* to Sect. *Tschudya* but certainly the seeds of *L. chimantensis*, as well as Gleason's notebook comments on his dissection of the Kew sheet of *Ule 8689,* indicate that the two relatives belong elsewhere in the genus. Both species suggest affinity with *L. itatiaiae* Cogn. and other 5-merous Brazilian species in Sect. *Chaetodon.*

Leandra maguirei Wurdack, sp. nov.

Sect. *Secundiflorae.* Ab sectionis omnibus speciebus differt conjunctione ramulis glandulifero-setulosis floribus 5-meris ovario 3-loculari apice setuloso.

Rami obtuse quadrato-sulcati petiolis inflorescentiisque dense longo-setulosi pilis brevioribus patentibus glanduliferis sparse vel dense -intermixtis. Petioli 1.5–3 mm; lamina 5–9(–11) × 3.5–5.5(–7.5) cm ovata apice anguste acuta vel gradatim breviterque acuminata basi vix (ad 4 mm) cordata rigidiuscula, supra modice bullulato-setulosa pilis ca. 1 mm longis vix incurvis basi expansis, subtus modice longo-setulosa et leviter foveolata, 7-nervata inconspicue incurvo-denticulata. Panicula 7–12 cm longa oblongo-pyramidata ramis usque ad 4 cm longis; flores 5-meri sessiles vel breviter (ad 1 mm) pedicellati; bracteolae ca. 1 mm longae spathulatae ciliolatae ad pedicellorum basim insertae persistentes. Hypanthium (ad torum) 3 mm longum dense brevisetosum pilis vix adscendentibus pilis brevioribus glanduliferis occultis sparse vel modice intermixtis; calycis tubus 0.1–0.2 mm altus, lobis interioribus 0.9–1 mm longis oblongo-orbicularibus ad margines vix ciliolatis, dentibus exterioribus callosis setulosis 0.7–0.9 mm eminentibus. Petala 2.5 × 0.8 mm apice acuta et mucronulata. Stamina isomorphica; filamenta 3–3.5 mm glabra; antherarum thecae 1.7–1.9 mm longae oblongae minute uniporosae, connectivo basi non prolongato sed dorsaliter appendice 0.2–0.3 mm longa descendenti truncata vel rotundata armato. Stylus 5 × 0.4 mm; stigma punctiforme; ovarium 3-loculare 2/3-inferum apice dense strigulosum pilis paucis glanduliferis intermixtis in collum lobulatum 0.6 mm altum circum stylum protractum. Semina 0.7 × 0.4 mm ovoidea minutissime densissimeque tuberculata.

Type. Shrub 1–1.5 m, stems deep red, inflorescence pale pink, petals white, filaments salmon, anthers yellow, occasional along escarpment at east head of Cañon Grande, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 1900–2000 m, 17 Dec 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42437*

(holotype US 2342615). Paratypes. VENEZUELA, Terr. Amazonas. Cerro de la Neblina: upper escarpment slopes east of Camp 3, alt. 1700 m, *Maguire, Wurdack, & Bunting 36841;* escarpment west of Cumbre Camp, alt. 1700–1800 m, *Maguire, Wurdack, & Bunting 37091.*

L. maguirei would key to species 174–177 of Cogniaux' Monograph, but differs from them in the harsher pubescence and 5-merous flowers. The glanduliferous hairs of the Neblina endemic are somewhat obscured by the overtopping simple setae.

Leandra sanguinea Gleason subsp. **tepuiensis** Wurdack, subsp. nov.

Calycis dentes exteriores ad anthesim 0.6–0.7 mm longi. Ovarii apex fere glaber cum setulis paucis glanduliferis 0.1 mm longis coronatus.

Type: Shrub 1.5–3 m, inflorescence branches red-tinged, flowers white, fruit reddish, frequent on escarpment slopes above Camp 3, Cerro de la Neblina, Terr. Amazonas, Venezuela, elev. 1600–1700 m, 17 Nov 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42030* (holotype US 2342601). Paratypes. VENEZUELA, Edo. Bolívar. Cerro La Danta: *fila* between kms 125 and 127, alt. 1200 m, *Steyermark & Nilsson 184.* Sororopán-tepuí: summit, alt. 1800 m, *Maguire & Wurdack 33953.* Chimantá Massif: waterfall course between northwestern part of Abácapa-tepuí and Apácara-tepuí, alt. 1200–1600 m, *Steyermark 75145;* base of escarpment, Torono-tepuí, alt. 1700 m, *Steyermark 75488;* slope forest of main section between Apácara-tepuí and Torono-tepuí, alt. 1400–1700 m, *Steyermark 76000, Steyermark & Wurdack 1243;* escarpment base, Amurí-tepuí, *Steyermark & Wurdack 1335.* Cerro Guaiquinima: slope forest near Intermediate Camp, alt. 1200 m, *Maguire 33106.*

The typical subspecies, known only from the Kaieteur Gorge, has subulate external calyx teeth 1.8 mm long and the ovary apex with a lobulate corona tipped with numerous glandular hairs 0.3–0.5 mm long. An isotype of the Potaro endemic (*Sandwith 1268,* NY) shows some gland-tipped hairs on the external calyx teeth, as well as incurved-setose stem and inflorescence pubescence; however the topotypical *Maguire & Fanshawe 23075* lacks glandular calyx hairs and has appressed stem and inflorescence indument. In subsp. *tepuiensis,* there is similar variability in the degree of hair appression; there also is variability in the density of the lower leaf surface hairs, some of the paratypes being sericeous-strigose but with no concomitant floral differentiation.

Leandra neblinensis Wurdack, sp. nov.

Sect. *Secundiflorae. L. sanguineae* Gleas. affinis sed inflorescentiis hypanthiisque dense glanduloso-setosis petalis staminibusque maioribus.

Ramuli petiolique dense setosi pilis i.s. nigrescentibus vix incurvis 2–4 mm longis. Petioli 1–3.5 cm; lamina 9–20 × 5–13.5 cm elliptica apice breviter (0.5–2 cm) hebeti-acuminata basi rotundata membranacea, supra modice strigosa pilis 2–3 mm longis, subtus in venis dense setosa in superficie modice setosa pilis gracilibus flexuosis, 5–7-nervata ad margines crenulato-serrulata. Panicula 15 cm longa oblongo-pyramidata dense glanduloso-setosa pilis plerumque 1–2 mm longis ramis divaricatis usque ad 7 cm longis; flores 5-meri sessiles ad basim bracteolati, bracteolis 1–1.5 mm longis oblongis setulosis. Hypanthium (ad torum) 3 mm longum dense glanduloso-setulosum pilis ad 2 mm longis; calycis tubus 0.1 mm longus, lobis interioribus 0.2–0.3 mm altis triangulari-rotundatis glabris, dentibus exterioribus lineari-oblongis 0.5 mm longis extus glanduloso-setulosis. Petala 3.5–4 × 1.2–1.8 mm oblongo-ovata acuta. Stamina isomorphica; filamenta 2 mm longa; antherarum thecae 2 mm longae anguste oblongae minute porosae, connectivo non prolongato exappendiculato. Stylus 5–5.5 × 0.3 mm; stigma subcapitellatum 0.4 mm diam; ovarium 3-loculare 2/3-inferum apice in collum modice glanduloso-setulosum 0.4 mm altum protractum.

Type. Shrub 1–1.5 m, inflorescence hairs reddish, petals pale pink, anthers yellow, occasional in Clusia scrub forest just south of Camp 3, slopes of Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 700 m, 14–16 Nov 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42077* (holotype US 2342603).

L. sanguinea has eglandular inflorescence and hypanthium hairs, petals 2.5–3 × 0.4–0.7 mm, and anthers 1–1.5 mm long. All of the secundiflorous 5-merous species (several of which are dubiously distinct) with an aspect similar to *L. sanguinea* and *L. neblinensis* have 5-celled ovaries. These include *L. longicoma* Cogn. (ovary glabrous: *Asplund 14369, Haught 1840*), *L. dichotoma* (Don) Cogn. (ovary glandular-setulose), *L. granatensis* Gleas. (ovary glandular-setulose; *Haught 1311*), *L. grandifolia* Cogn. (ovary sparsely glandular-setulose; *Donnell Smith 6557, Tonduz 9012*), *L. reversa* (DC.) Cogn. (ovary glandular-setulose; *Ule 908*), and *L. francavillana* Cogn. (vide infra). Cogniaux' descriptions are at variance with some of the above-cited ovary details, as well as for *L. retropila* Cogn. (ovary 5-celled, glabrous: *Camp E-1419, Killip & Smith 22672*); for each collection cited by me, several ovary dissections are represented. I have seen no material of *L. agrestis* (Aubl.) Raddi, apparently a rare French Guiana endemic with (fide Cogniaux) a glabrous 3-locular ovary; from the Macbride photograph (36220), the leaves are very thin, sparsely pubescent, and with notably crenulate margins.

Leandra francavillana Cogn.

Examination of a bud of an isosyntype (*Spruce 2045*, K) showed a 5-locular sparsely setulose ovary. Both this collection and *Spruce 2184* (Macbride photograph 36230) have immature inflorescences, with the latter collection apparently having slightly denser lower leaf surface pubescence. *Schultes & Cabrera 13917* (Mitú, Vaupés, Colombia) and *Fróes 28211* (Rio Uaupés, Amazonas, Brazil) agree well with *Spruce 2184* in leaf pubescence and have mature expanded inflorescences (the primary lateral fruiting branches up to 6–10 cm long). *Cardona 1329* (VEN), from the headwaters of the Río Siapa on the Venezuela-Brazil frontier, accords well with *Spruce 2045* in inflorescence development. Three recent Venezuelan collections have mature foliage pubescence slightly less dense and inflorescence more mature and expanded than the Cardona material, but are certainly conspecific with it; these numbers (*Maguire & Wurdack 34956*, from Piedra Nunca, Río Negro; *Maguire, Wurdack, & Bunting 36700, Maguire, Wurdack, & Maguire 41943*, both from the uppermost Río Yatua) and *Cardona 1329* all have 5-celled ovaries. I concur with Macbride's implied exclusion of this species from the Peruvian flora; all Loreto and Junin material purporting to be *L. francavillana* has glandular-strigose hypanthia.

As compared with *L. francavillana, L. divaricata* (Naud.) Cogn. has an inflorescence as wide as or wider than long, a glabrous 3-celled ovary, and smaller (usually) leaf blades which are strigulose or short-strigose beneath only on the primary and secondary veins. Gleason's notes indicate that he included here *L. rhamnifolia* (Naud.) Tr. var. *macrodon* (Naud.) Cogn.; certainly the Sellow and Riedel material (K, US) of *L. rhamnifolia* var. *rhamnifolia* does not seem specifically distinct from *L. divaricata;* many recent British Guiana collections ascribable to this complex (*Gleason 665, Hitchcock 17324, Tutin 313, Maguire & Fanshawe 22918, de la Cruz 1149, 1525, 1985, 2323, 3869*) show varying degrees of hypanthial glandulosity. The rather similar *L. secunda* (Don) Cogn. (of Amazonian Peru, Ecuador, and Colombia), also with gland-tipped hypanthial hairs, has however a 5-celled sparsely glandular-setulose ovary. *L. secundiflora* (DC.) Cogn. was characterized as with 4-merous flowers by Cogniaux; however, at least one Cogniaux-cited collection (*Traill 257*, K) has 5-merous flowers (with a glabrous 3-celled ovary). If the Martius holotype (which I have not seen) is conspecific with the Traill specimen, *L. divaricata* would revert to synonymy under *L. secundiflora.*

Miconia iluensis Wurdack, sp. nov.

Sect. *Tamonea. M. guianensi* (Aubl.) Cogn. affinis sed stylo sparse glanduloso-puberulo toro ovarioque glabris.

Frutex vel arbor parva; rami subnodosi obtuse quadrangulares primum cum petiolis foliis supra inflorescentiis bracteisque sparse stellulato-furfuracei demum glabrati. Petioli 2–3.5 cm; lamina (acumine excluso) 10–14 × 3.5–6 cm elliptica apice breviter graditer angusteque per 0.5–1 cm acuminata basi late acuta vel obtusa rigide membranacea, ut videtur glabra sed sub lente subtus sparse persistenterque stellulato-furfuracea et in nervorum primariorum axillis sparse inconspicueque pilis barbellatis 0.5–1 mm longis apice vix stellatis ornata, 5-nervata nervis secundariis plerumque 4–5 mm inter se distantibus, integra non ciliata. Panicula 10–12 cm longa oblonga, ramis ascendentibus ad nodos plerumque 4-verticillatis apice floribus 6-meris ad basim bibracteatis in dichasio; pedicelli 6–12 mm longi; bracteae 8–10 × 5–7 mm obovato-ellipticae apice obtusae ad anthesim caducae. Hypanthium (ad torum) 3.8–4 mm glabrum; calycis tubus 1 mm altus apice truncatus vel vix 6-undulatus glaber, dentibus exterioribus non evolutis; torus glaber. Petala 8.5–9 × 4.5–5 mm obovato-oblonga apice asymmetrice rotundato-truncata ad margines densiuscule glandulis sessilibus minutissimis obsita alioqui glabra. Stamina glabra vix anisomorphica; filamenta 7.5 vel 6.5 mm; antherarum thecae 8–8.5 vel 6–6.5 mm subulatae undulatae apice minute uniporosae, connectivo sub loculis ventraliter appendice 0.5–0.6 × 1 mm truncata vel vix emarginata ornato dorsaliter non appendiculato sed ca. 1–2 mm supra basim distincte elevato. Stylus 12.5 × 0.6–0.8 mm infra medium sparse glanduloso-setulosus apicem versus vix expansus; stigma expansum 1.5 mm diam; ovarium 4-loculare 1/5-inferum apice in collum crassum lobulatum 0.5 mm altum circum stylum protractum glandulis minutissimis sessilibus sparsis exceptis glabrum.

Type. Petals pink, anthers yellow, occasional on slopes between Camp No. 2 and escarpment base, Ilu-tepuí, Edo. Bolívar, Venezuela, alt. 1900–2300 m, 16 Mar 1952, *Bassett Maguire 33436* (holotype US 2342473).

All of the 20 observable flowers in the type collection were 6-merous. *M. guianensis* and the other species included in the discussion of *M. superba* Ule (vide infra) have a sparsely to moderately stellate-puberulous torus and ovary, as well as a glabrous to basally moderately stellate-pubescent style. In vegetative pubescence density, *M. iluensis* is like the glabrescent element, *M. florida* (DC.) Naud., included in *M. guianensis* by Gleason. The divergence from the postulated relatives in interior floral pubescence may well indicate that, despite the remarkable resemblance in aspect, *M. iluensis* is more closely related to species 18–27 of Cogniaux' monograph; all of these species have either glandular filaments, smaller flowers, or smaller bracts.

Miconia superba Ule.

M. pachypoda Gleason, Fieldiana Bot. **28**: 435. 1952.

Certainly two morphologically distinct species are involved in the *M. pachypoda–M. superba–M. acutifolia* Ule complex, the ends of the line being altitudinally separated (as quite clearly seen by me on the Chimanta Massif). In the ecotone, however, there apparently has been hybridization, and unfortunately *Ule 8695* represents an intermediate. In overall features (flower and leaf size), the Ule collection falls slightly nearer *M. pachypoda*. The intermediates here placed under *M. acutifolia* show varying development of gland-tipped hairs up to 1.5 mm long on the stems, petioles, and inflorescence, but have the leaf and flower size of the eglandular *Ule 8694*. In the cumbres, *M. acutifolia* shows a leaf size reduction over the subcumbre elements and, like typical *M. acutifolia*, lacks glandular hairs.

In addition to the above complications, I believe there has been some hybridization between *M. acutifolia* and the widespread species *M. guianensis* (Aubl.) Cogn. and *M. dodecandra* (Desr.) Cogn, both of which are found in the eastern tepuí slope forests. *Maguire 33416*, from Ilu-tepuí, apparently is *M. acutifolia* with strong introgression (broad leaves, rather smaller stellate hairs) from *M. guianensis*. *Cardona 244* (Auyán-tepuí), *Steyermark & Wurdack 1003* (Chimantá Massif), and *Steyermark 59718* (Ptari-tepuí) have rather narrow rigid leaves suggestive of *M. acutifolia*, but with the strongly stellate-pubescent hypanthia of *M. dodecandra*. The species nodes in these four taxa (all characterized by stellulate-pubescent tori) may be keyed as follows:

1. Hypanthia densely stellulate-pubescent. *M. dodecandra.*
1. Hypanthia glabrous at anthesis.
    2. Stems densely setose with simple hairs 5–12 mm long. *M. superba.*
    2. Stems with or without gland-tipped smooth hairs, but without simple hairs.
        3. Leaf blades thin-coriaceous, the lower surface pubescence pale brown. *M. guianensis.*
        3. Leaf blades rigid-coriaceous, the lower surface pubescence tawny. *M. acutifolia.*

The key characters for separation of *M. superba* and *M. acutifolia*, including most hybrid elements, are:

Stem setae (in part at least) simple, without glandular-tips, 3–12 mm long; leaf blades 10–25 cm wide, the lower surface pubescence pale brown; hypanthium plus calyx 6.5–7 mm long. *M. superba.*
Stem setulae absent or gland-tipped, to 1.5 mm long; leaf blades at most 7 cm wide, the lower surface pubescence rufous; hypanthium plus calyx 4.5–5 mm long. *M. acutifolia.*

The variability between *M. superba* and *M. acutifolia* may be arranged lineally as follows:

M. superba.

1. Unadulterated, as in *M. pachypoda,* with only simple long cauline pubescence.

VENEZUELA, Edo. Bolívar. Chimantá Massif: *Steyermark 75152, Wurdack 34077*. Serranía Paujil: *Bernardi 6824*. Aprada-tepuí: *Bernardi 776*. Ptari-tepuí: *Steyermark 59447*. Ilu-tepuí: *Maguire 33612*. Cerro La Danta: *Steyermark & Nilsson 223*. *BRITISH GUIANA*. Karowtipu: *Tillett & Tillett 45556*.

2. Adulterated, with both simple and gland-tipped cauline hairs.

VENEZUELA, Edo. Bolívar. Roraima: *Ule 8695* (isotype MG).

M. acutifolia.

1. Atypical, with large leaves and gland-tipped stem hairs, but reddish lower leaf surface pubescence and normal flower size.

VENEZUELA, Edo. Bolívar. Uaipán-tepuí: *Phelps & Hitchcock 437* (NY).

2. Typical, except for gland-tipped stem hairs.

VENEZUELA, Edo. Bolívar. Chimantá Massif: *Cardona 1958, Steyermark 75827, Steyermark & Wurdack 1138, Wurdack 34168, 34264.* Uaipán-tepuí: *Phelps & Hitchcock 404.*

3. Typical.

VENEZUELA, Edo. Bolívar. Roraima: *Ule 8694* (isotype MG). Ilu-tepuí: *Maguire 33403.* Sororopán-tepuí: *Steyermark 60135.* Ptari-tepuí: *Steyermark 59587.*

4. Atypical cumbre, with shorter relatively broader leaves.

VENEZUELA, Edo. Bolívar. Uei-tepuí (Serra do Sol): *Maguire & Maguire 40414.* Chimantá Massif: *Steyermark & Wurdack 744.*

Miconia silicicola Gleason.

Originally described from Roraima and Duida, this widespread species is now known also from the Chimantá Massif, Ilu-tepuí, Guanay, Yutaje, and Coro-Coro. The foliage is quite variable in shape, ranging from obovate-elliptic and scarcely contracted to a clasping base to broadly oblanceolate with narrow base. The compiled floral description shows the following: hypanthium 3.8 × 3.5 mm, calyx tube 1.3 mm, the lobes closed in bud and 0.1–0.4 mm high at anthesis each with an external subapical tooth; petals 4 × 2 mm, white, obovate with rounded apex, externally caducously pulverulent; stamens slightly dimorphic in size; filaments 5 or 4.5 mm, very sparsely glandular-setulose, the hairs 0.1 mm long; anthers 4.1 or 2.8 mm, subulate, the connective base with 1–4 pairs of short-stalked glands; style 7 × 0.5–0.6 mm, sparsely glandular-setulose on the basal half; stigma subcapitate, 0.65 mm diam.; ovary 3-celled, 1/5-inferior, the apical collar 0.3 mm high and sparsely glandular-setulose. The slightly smaller flowers and leaves, as well as the stipitate (stalk 0.05–0.1 mm) sublepidote-stellate lower leaf surface pubescence, differentiate *M. silicicola* from *M. plukenetii* Naud.; the latter has sessile sublepidote-stellate foliar hairs.

Miconia tillettii Wurdack, sp. nov.

M. pseudocapsulari Wurdack affinis sed floribus paniculatis non secundis calycis dentibus exterioribus anguste triangularibus vix eminentibus.

Frutex vel arbor parva 1.5–8 m inflorescentiis exceptis glabra. Folia aequalia vel vix inaequalia; petioli 1.5–5 cm; lamina 10–30 × 4.5–10 cm elliptica vel vix obovato-elliptica apice per 1–1.5 cm subabrupte hebeti-acuminata basi cuneata membranacea fragilis 5-plinervata jugo interiore subalternatim 1–2.5 cm supra basim inserto jugo exteriore attenuato marginali nervis secundariis plerumque 5–10 mm inter se distantibus tertiariis paucis laxissime reticulatis integra. Panicula 6–13 cm longa pyramidata inconspicue caduceque furfuracea ramulis ultimis in dichasiis 2–3-floris interdum congestis; bracteolae 0.3–0.5 mm longae subulatae persistentes ca. 0.8–1 mm infra hypanthium insertae; flores 5-meri ca. 1–1.2 mm pedicellati glabri. Hypanthium (ad torum) 2.5 × 1.5 mm anguste oblongum vix 10-costatum; calycis tubus 0.1 mm altus, lobis interioribus 0.5–0.6

mm longis orbiculari-triangularibus apice rotundatis, dentibus exterioribus 0.2–0.4 mm eminentibus apiculatis. Petala 2 × 0.8 mm obovato-oblonga apice vix oblique emarginata glabra. Stamina in dimensionibus vix dimorphica; filamenta 3.5 vel 2.5 mm; antherarum thecae 2.6 vel 2.3 mm subulatae sub filamenti insertionem ventraliter 0.5–0.6 mm prolongatae et cum connectivo coalitae, connectivo sub thecas non prolongato dorsaliter non appendiculato. Stylus 12.5 × 0.25 mm; stigma truncatum; ovarium 3-loculare 1/8-inferum apice in collum 0.1–0.15 mm longum circum stylum protractum et 5–6 setulis 0.05 mm longis ornatum. Semina 0.5–0.6 mm longa laevia vel inconspicue sparseque tuberculata.

Type. Leaves dark green above, light green beneath, brittle, calyx and corolla white, anthers yellow, frequent in forest below talus along cliffs on NE side of Mt. Ayanganna, upper Mazaruni River, British Guiana, alt. 800–900 m, 1 Aug 1960, *Stephen S. Tillett, Carolyn L. Tillett, & Rufus Boyan 44977* (holotype US 2343854). Paratypes. SURINAM. Tafelberg: overhanging East Ridge Gorge, *Maguire 24533*. BRITISH GUIANA. Mt. Ayanganna: alt. 1070 m, *Tillett, Tillett, & Boyan 45130*. Karowtipu: alt. 490 m, *Tillett, Tillett, & Boyan 45439*. VENEZUELA, Edo. Bolívar. Sororopán-tepuí: alt. 1500–1800 m, *Steyermark 60177, Maguire & Wurdack 33960*. Carrao-tepuí: alt. 1400–1600 m, *Steyermark 60843*.

M. pseudocapsularis has completely secund flowers on pedicels only 0.5 mm long and inner calyx lobes equaling the subulate external teeth; originally known only from Amazonas, the species has also been collected on the slopes of Torono-tepuí (a part of the Chimantá Massif in Edo. Bolívar) at 1500 m elevation (*Steyermark 75490*). The foliage of *M. tillettii* is rather reminiscent of, although much thinner than, that of *M. fragrans* Cogn. *M. fragrans* is known from Trinidad, Tobago, British Guiana (Mt. Ayanganna, *Tillett, Tillett, & Boyan 45143*), and Venezuela (Cerro La Danta, Edo. Bolívar, *Steyermark & Nilsson 30,188*).

The related species, *M. lateriflora* Cogn., continues to accumulate synonyms. *M. tessmannii* Mgf., from Amazonian Peru, is the same as Amazonian and Guianan material previously referred to *M. lateriflora*. As would be expected in such a wide-ranging species, there is some variability; Central American and Pacific Colombian collections show calyx teeth 1.5–2 mm long, while Amazonian and most Guianan specimens have teeth only 1 mm long. More extreme are the Kanuku Mountains (British Guiana) collections (*A. C. Smith 3571, 3665*), with pedicellate lateral flowers in each dichasium, as well as the calyx limb only undulate-rimmed and inconspicuously toothed. Probably subspecific recognition (or perhaps specific in the case of the Kanuku population) will be given to the variants; in any event, Markgraf's name properly falls under the typical subspecies of *M. lateriflora*.

Miconia mariae Wurdack, sp. nov.

M. centrodesmae Naud. affinis, sed foliis crassioribus non plinervatis floribus 5-meris ovario apice in collum circum stylum protracto.

Ramuli vix compressi demum teretes petiolis foliorum venis primariis subtus inflorescentiisque sparse stellato-puberuli mox glabrati. Petioli 1.5–4 cm; lamina 12–22 × 5–13 cm elliptica apice per 0.5–1 cm graditer hebeti-acuminata basi obtusa vel rotundata rigide membranacea, in superficie glabra, ad margines sparse appresso-ciliolata et integra vel inconspicue crenulato-serrulata, 5-nervata nervulis laxe reticulatis. Panicula 7–12 cm longa diffusa ramis lateralibus oppositis vel 4-verticillatis; pedicelli 0–0.5 mm longi; bracteolae ca. 0.3 mm longae setaceae; flores 5-meri. Hypanthium (ad torum) 1.8 mm longum inconspicue 10-costatum glabrum; calyx primum clausus, cono 0.8 mm alto apiculato, demum in lobis membranaceis irregularibus ruptus; torus dense glanduloso-ciliolatus pilis 0.05 mm longis. Petala 3 × 1.2–1.5 mm oblongo-obovata apice rotundata glabra. Stamina fere isomorphica; filamenta 1 mm longa; antherarum thecae 1 mm longae apice minute uniporosae, connectivo ad filamenti insertionem non prolongato dorsaliter appendice 0.15 × 0.15 mm descendente distaliter vix emarginata. Stylus 5.5 × 0.3 mm glaber; stigma truncatum; ovarium 3-loculare apice modice glanduloso-puberulum (pilis 0.05 mm longis) et in collum 0.7 mm altum circum stylum protractum.

Type. Shrub 3 m, petals, filaments, and style white, anthers yellow, locally frequent in slope forest at base of southwest-facing lower escarpment of Amurítepuí, Chimantá Massif, Edo. Bolívar, Venezuela, alt. 1275 m, 11 Mar 1955, *J. A. Steyermark & J. J. Wurdack 1369* (holotype US 2342424).

The specific epithet commemorates my botanical illustratress. All of the 15 examined flowers were 5-merous. *M. centrodesma* has membranous 5-plinerved leaf blades, predominantly 4-merous flowers, and a truncate ovary apex. Since my previous synonymy summary of *M. centrodesma*, an isotype (G-DEL) of *M. centrandra* Ule has been examined; *Ule 9675* conforms with abundant other material of *M. centrodesma* and, accordingly, *M. centrandra* can be placed in synonymy.

Miconia cautis Wurdack, sp. nov.

Sect. *Miconia. M. platypodae* Gleason affinis sed dichasiis pedunculatis inflorescentiae pilis pallide rubris.

Rami primum vix compressi mox teretes cum petiolis inflorescentiis hypanthiisque dense stellulato-furfuracei. Petioli 0.7–2 cm longi valde compressi; lamina 9–22 × 3.5–7 cm anguste oblongo-elliptica recta vel vix falcata apice breviter (0.5–1.5 cm) subabrupteque hebeti-acuminata basi acuta rigide membranacea, supra glabra, subtus in venis primariis sparse vel modice stellulato-furfuracea alioqui glabra, breviter (2–5 mm) 3-plinervata nervulis subtus creberrime elevato-reticulatis, integra. Panicula 7–11 cm longa pyramidata, ramis primariis infimis 4–6 cm longis ramulis 3–6 mm longis; flores 4-meri sessiles vel vix (ad 0.5 mm) pedicellati; bracteolae 0.1–0.2 mm longae lanceolatae stellulato-furfuraceae mox caducae ad hypanthii basim insertae. Hypanthium (ad torum) 1.9–2.2 mm longum apicem versus sparsissime glanduloso-setulosum setulis 0.2–0.3 mm longis; calycis tubus 0.2 mm altus, lobis interioribus 0.5–0.55 × 0.7 mm triangularibus, dentibus exterioribus hebeti-acutis vix (0.1 mm) eminentibus. Petala 0.7 × 0.4 mm late elliptica apice rotundata inconspicue granulosa. Stamina isomorphica glabra; filamenta 1 mm longa; antherarum thecae 1.6 mm longae lineari-lanceolatae, connectivo cum thecis coalito non incrassato. Stylus 2.7 × 0.2 mm glaber; stigma truncatum; ovarium biloculare ca. 1/4-inferum apice in collum 0.3 mm altum modice stellulato-furfuraceum circum stylum protractum.

Type. Shrub 1.5 m, inflorescence branches reddish, flowers white, slope forest of Piedra Tururumeri, Río Yatua, Terr. Amazonas, Venezuela, alt. 110–220 m, 4 Feb 1954, *Bassett Maguire, John J. Wurdack, & George S. Bunting 37498* (holotype US 2342550). Paratypes. VENEZUELA, Terr. Amazonas. Río Yatua: base of Piedra Arauicaua, alt. 100–140 m, *Maguire, Wurdack, & Bunting 37456.* Cerro Duida: Caño Negro slopes, alt. 305–1095 m, *Steyermark 57967.* COLOM-

BIA, Vaupés. Río Guainía: Río Naquieni at base of Cerro Monachí, *Schultes & Lopez 10129*. BRAZIL, Amazonas. Rio Içana: Tunuí, *Froes 28127*.

The specific epithet refers to the usual species habitat, on crystalline monadnocks with hazardous phenocrysts. *M. platypoda* has the same pubescence and foliage as *M. cautis,* but inflorescences as in *Diplostachyae* and the inflorescence hairs pale. Both species have stellulate-puberulous ovary apices and a few inconspicuous glandular hypanthial hairs. A second collection, with a considerable range extension, of *M. platypoda* is *Ducke 15031* (*MG*), from the Rio Erepecuru at the Serra do Camahú, Pará, Brazil.

Both species are related to *M. undata* Tr., with glabrous foliage, 5-merous flowers, and a glabrous hypanthium. The holotype (*Spruce 2000,* K) of the Barcellos endemic has been examined; the single open flower dissected by Triana has anthers 1/3 larger than in *M. cautis* and oblong petals 2.2 mm long (dry). The ovary is sparsely and minutely puberulous apically and one of four observable buds was 4-merous; both the inflorescence and calyx lobes (but not the hypanthium) are sparsely stellulate-furfuraceous with hairs somewhat smaller than in *M. cautis,* but there is no trace of gland-tipped hairs. Spruce's field notes read: ''Rio Negro-stony forest as far as Barcellos, but not yet in flr. Nov./51. Weak shrub 4–6 ft. Fl. white.'' All three species are suggestive in flowers of *Leandra* sect. *Tschudya,* especially (ex char.) *L. pulverulenta* (DC.) Cogn.; that species has (fide Cogniaux) ciliate 3–5-nerved leaves and a densely setulose ovary.

Miconia curta (Gleason) Wurdack, comb. nov.

Graffenrieda curta Gleas. Fieldiana Bot. **28**: 431. 1952.

The blunt dorsal stamen connective tooth, the 1/3 inferior ovary, and the baccate fruit (seen in recent collections, as well as in the paratype) all require placement of this species in *Miconia.* The calyx is not closed in bud, but with imbricate stellulate-fringed lobes. Of the available flowers in the various collections, 21 were 4-merous and 26 5-merous. Of the ovaries dissected, 3 were 4-celled and 5 3-celled. Most of the leaf blades are shortly plinerved, with occasional basally nerved ones; the blade bases are broadly acute to obtuse (and not rounded as on the holotype). *M. curta* is rather similar to *M. laevigata* (L.) DC. in the pubescence and membranous calyx lobes, but differs in the denser leaf veinlet reticulation, convex-sided sepals, and somewhat prolonged stamen connective with only a dorsal tooth.

Miconia curta (Gleas.) Wurdack subsp. **ptariensis** Wurdack, subsp. nov.

Ovarii apex setulis ca. 10, 0.8–1.7 mm longis 5 alternatim 0.8 mm longis.

Type. Shrub 3 m, flowers white, occasional in woodland, southwest slopes of Ptari-tepuí, Edo. Bolívar, Venezuela, alt. 1600–2000 m, 17 Dec 1952, *Bassett Maguire & John J. Wurdack 33871* (holotype US 2342478). Paratype. VENEZUELA, Edo. Bolívar. Ptari-tepuí: forested south-facing slopes on ''Cave Rock,'' alt. 1810 m, *Steyermark 59518.*

In the typical subspecies (now known from Duida, Huachamacari, Guaiquinima, and the Chimantá Massif), the ovary apex is truncate and sparsely stellulate-furfuraceous, but with no trace of setae.

Miconia phaeophylla Triana.

M. fendleriana Cogn. DC. Mon. Phan. **7**: 822. 1891.

There are no floral differences between the Peruvian and Venezuelan collections, and Guayana material easily bridges the obscure gap in leaf base characters. Of more import is the distinctness from other related species. Flower-mery in the group is a difficult character to use; *M. puberula* Cogn. seems predominantly 4-merous (as shown also in the Flora Brasiliensis illustration, despite Cogniaux' 5-merous description), while *M. brevipes* Benth. seems to be 4–5(–6, fide Gleason's notes)-merous. The poorly known *M. kappleri* Naud. and *M. fragilis* Naud. are both suggestive of this relationship; they apparently differ from the pubescent species in the glabrous stem internodes and leaves and (except for *M. puberula*) the smaller flowers. The Guayana complex, including the *M. minutiflora* (Bonpl.) DC. alliance, may be tentatively keyed as follows:

1. Young internodes and lower leaf surfaces glabrous. *M. minutiflora* and allies.
1. Young internodes and lower leaf surfaces densely stellate-puberulous.
    2. Large anther thecae 1 mm long or less. *M. puberula.*
    2. Large anther thecae 1.5–2.5 mm long.
        3. Young stem hairs all sessile-stellate. *M. phaeophylla.*
        3. Young stem hairs in part stipitate-stellate.
            4. Lower leaf surface hairs ca. 0.4 mm diam and stipitate-stellate. *M. rubiginosa.*
            4. Lower leaf surface hairs ca. 0.25 mm diam and mostly sessile-stellate. *M. brevipes.*

Specimens examined:

M. puberula.

PERU, San Martín: *Klug 3362, Spruce s.n.* (isosyntype NY).

M. phaeophylla.

PERU, San Martín: *Spruce 4861* (isotype NY). COLOMBIA, Vaupés: Cerro La Campana, *Schultes 5569* (NY). Huila: Hacienda Miraflores, *Little 7307* (US). VENEZUELA, Trujillo: *Pittier 13134* (NY, US). Carabobo: *Pittier 8019* (US). Aragua: *Llewelyn Williams 10243* (US), *10467* (US). Bolívar: Kavanayén, *Maguire & Wurdack 33990;* Cerro Perro, *Cardona 756* (US); Uaiparú, *Bernardi 6566* (NY); Cerro Cotorra, *Steyermark 86868* (US); Río Asa, *Steyermark 86732* (US). Amazonas: Savanna Hills, Cerro Duida, *Tate 724* (NY); Esmeralda, *Llewelyn Williams 15320* (US), *Maguire & Wurdack 34630*. BRITISH GUIANA. Utschi Falls, Kamarang River, *Tillett & Tillett 45801.*

M. brevipes.

VENEZUELA, Amazonas: Pto. Ayacucho, *Llewelyn Williams 13805* (US); Sanariapo, *Llewelyn Williams 13066* (US); Santa Barbara, *Cowan & Wurdack 31597;* Esmeralda, *Llewelyn Williams 15329* (US), *Maguire & Wurdack 34668, Steyermark 57763* (NY). Bolívar: Cerro Perro, *Cardona 750* (US); Cerro Bolívar, *Wurdack 34461* (var. *longifolia* Cogn.?; with large leaves, suggestive of *M. phaeophylla*). BRITISH GUIANA. "Roraima," *Schomburgk 934* (probable isotype, fide Gleason, NY); Isherton, Rupununi River, *A. C. Smith 2475* (US); 35 miles south of Mackenzie, *Cowan 39258.*

Miconia arirambae Huber.

No sheet of the type number, *Ducke 8089,* was found by curators at the larger European herbaria (G, K, L, M, P, W), nor in the two Rio de Janeiro collections (R, RB). Among the miscellaneous sheets at the Museo Goeldi is a sheet of this collection with "Miconia Duckei Hub. n. sp." on the label; the epithet was penciled out. I believe this sheet to be the holotype of *M. arirambae,* not reannotated by Huber after he discovered Cogniaux' prior use of the epithet. The species seems to be fairly common in Venezuelan Guayana, with specimens from Bolívar (*Aristeguieta 2219, Steyermark 59204, Wurdack 34373*) and Amazonas (*Maguire & Maguire 35058, Cowan & Wurdack 31490-A*), as well as from British Guiana (*Maguire & Fanshawe 32182*) and the lower Trombetas and Rio Maro in Brazil (*Ducke 10957, Pires & Silva 4387*). However, I can find no differences in minute details from the isotype (NY) of *M. albo-rufescens* Naud. Unfortunately the sheet of *Claussen 154* has only young fruit and no flowers. Almost certainly, a comparison of flowering material from Minas Gerais with the excellent Guayana collections will establish this synonymy.

Miconia wittii Ule.

Unfortunately, the available isotype (MG) of this species shows only very young buds. After comparison of foliar and inflorescence details, several recent Brazilian, Colombian, and Venezuelan collections seem at least conspecific with Ule's Manáos material. The leaf blades vary considerably, from narrowly oblong-ovate to elliptical with shortly acuminate to bluntly acute apices, and from 3- to indistinctly 5-nerved; the recent specimens have generally smaller leaf blades than the type. The anther connectives are clearly prolonged 0.7–0.9 mm basally and with either a cordate dorso-ventral appendage or a blunt dorsal tooth; I cannot interpret if this accords with Pilger's (as *M. micrantha* Pilger) "antheris . . . basi truncatis" statement. The general vegetative features of *M. wittii* resemble those of the *M. elaeagnoides* Cogn.-*M. dichrophylla* Macbr. complex discussed by Gleason (Bull. Torrey Club **58**: 242. 1931), but the flowers are not secund as in that southwest Amazon basin species. *M. wittii* is also suggestive of the rarely collected *M. elata* (Sw.) DC.; that West Indian species differs at least in the tetragonal young branches, undulate-denticulate leaf margins, and less appressed lower leaf surface pubescence. Until topotypical material proves otherwise, the following are referred to *M. wittii:*

BRAZIL, Amazonas: Rio Içana, São Felipe, *Froes 27884, 27892.* COLOMBIA, Vaupés: Soratama, Río Apaporis, *Schultes & Cabrera 12555.* VENEZUELA, Amazonas: Caño San Miguel, Río Guainía, *Wurdack & Adderley 43247;* east bank of Río Casiquiare 300 m below mouth of Río Pacimoni, *Maguire & Wurdack 35727;* Savanna No. 1 at northwest base of Cerro Yapacana, *Maguire & Wurdack 34496;* Caño Cupaven, Río Orinoco, *Wurdack & Adderley 42807.*

Miconia perturbata Wurdack, sp. nov.

Sect. *Glossocentrum. M. tetragonae* Cogn. affinis sed foliis breviter hebeti-acuminatis hypanthiis amplioribus distincte lobulatis staminis minoris connectivo basi ventraliter appendiculato.

Arbor 5 m. Rami primum hebeti-quadrangulares demum tereti foliorum venis primariis subtus petiolis inflorescentiis hypanthiisque primum sparse stellulato-puberuli mox glabrati. Petioli 1–2.5 cm; lamina 8–14 × 5–7 cm elliptica apice breviter (5–7 mm) hebeti-acuminata basi late acuta vel obtusa tenuiter coriacea integra eciliata 5-nervata jugo exteriori tenui nervulis laxe reticulatis reticulis irregularibus ca. 2–3 mm latis, supra et subtus in superficie glabra. Panicula 8–12 cm longa lataque ramis primariis secundariisque plerumque 4(–6)-verticil-

latis; flores 5-meri ca. 1–2 mm pedicellati, bracteolis 0.5 mm longis subulatis sparse stellulato-furfuraceis ad hypanthii basim insertis mox caducis. Hypanthium (ad torum) 1.1 mm longum teres modice pilis brevissimis clavatis lucidis obsitum; calycis tubus 0.2 mm altus, lobis interioribus 0.2 mm altis triangularibus basi vix remotis, dentibus exterioribus distinctis non eminentibus. Petala alba 1.7–1.8 × 0.9–1 mm oblonga apice rotundata vel inconspicue emarginata dense minuteque papillosa. Stamina vix dimorphica glabra, filamentis 1–1.2 mm longis. Stamina maiora: antherarum thecae 0.35–0.4 mm longae apice truncatae et late porosae, connectivo 0.5–0.6 mm prolongato basi dorsaliter cum appendice descendente truncata 0.4 × 0.4 mm. Stamina minora: antherarum thecae 0.3 mm longae apice late porosae, connectivo 0.4 mm prolongato basi dorsaliter appendice descendenti distaliter rotundata 0.2 mm longa. Stylus 2 × 0.25 mm glaber; stigma inconspicue expansum; ovarium 3-loculare 1/2-inferum 12-ovulatum apice imperspicue papillosum.

Type. Occasional along Cañon Grande SSW of Cumbre Camp, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 1100 m, 24 Dec 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42474* (holotype US 2342616).

Examination of buds of *Spruce 2747* (NY) revealed stamens quite similar to those of *M. perturbata* but with the small anther connectives consistently simple at the filament insertion, as well as a truncate calyx limb and hypanthium plus calyx (at a comparable bud stage) only 2/3 as long. *M. tetragona* also has leaf apices slenderly acuminate for 1–1.5 cm and veinlet reticules mostly less than 1 mm across, but large anther connectives dorsally appendiculate as in the Neblina species. Probably both relatives should be aligned with *M. pilgeriana* Ule and *M. stellipilis* Cogn. which also have the mostly sterilized anther thecae noted by Gleason (Bull. Torrey Club **63**: 536. 1936). I have reservations as to the distinctness of *M. pilgeriana* from *M. tetragona*, and at least part of the material cited in Macbride's Flora of Peru is referrable to *M. dolichorrhyncha* Naud. or *M. solmsii* Cogn. To *M. tetragona*, I have referred without doubt *Klug 635* (Mishuyacu, Loreto, Peru) and *Krukoff 9011* (S. Paulo de Olivença, Amazonas, Brazil); both these collections show the numerous minute glistening clavate hypanthial hairs seen in the Panure isotype. *A. C. Smith 2712* (Onoro Creek, British Guiana), distributed as *M. tetragona*, is better placed in *M. regelii* Cogn. because of the dense definitely stellulate hypanthial pubescence and the long anther thecae.

Miconia dioica Wurdack, sp. nov.

Sect. *Cremanium*. *M. manicatae* Cogn. & Gl. ex Gl. affinis sed foliis ovatis non ciliatis, ramis ad nodos in petioli insertionem elevatis non vere manicatis, floribus minoribus.

Frutex scandens ad 5 m altus glaber; ramuli primum rotundato-quadrangulares demum teretes ad petioli insertionem in cylindrum 1–2 mm longum elevati. Petioli 1–2 cm; lamina 4–8 × 2–4.5 cm lanceolata vel ovata apice per 0.5–1 cm subgraditer hebeti-acuminata basi rotundata tenuiter coriacea leviter (1–2 mm) triplinervata (jugo exteriore tenuissimo neglecto) nervis secundariis 1–3 mm inter se distantibus nervulis laxe reticulatis subtus primum modice nigropunctata punctis demum inconspicuis integra non ciliata. Panicula 4–8 cm longa pyramidata ramis primariis secundariisque rectis vel vix adscendentibus; flores 5-meri ut videtur dioici ca. 1 mm pedicellati, pedicellis ad medium bibracteolatis; bracteolae 0.7–1 mm longae oblongo-subulatae caducae. Hypanthium (ad torum)

0.9–1 × 0.9 mm; calycis tubus 0.05–0.1 mm altus, lobis interioribus ca. 0.15 mm longis remotis dentes exteriores tuberculatos aequantibus. Petala 0.7–0.75 × 0.7–0.9 mm rotundata apice vix retusa basi ca. 0.15 mm unguiculata apicem versus ad margines vix erosula glabra. Stamina isomorphica. Flores masculini: filamenta 1 mm longa; antherarum thecae 0.5 × 0.35 mm obovatae apice truncatae et late biporosae basim versus intus biseptatae, connectivo basi 0.1 mm prolongato incrassato non lobulato; ovarium abortivum non ovulatum, stylo 0.2 mm longo incluso, stigmate punctiforme. Flores feminini: stamina abortiva, filamentis 0.8 mm longis, antherarum thecis 0.2 mm longis late biporosis, connectivo 0.15 mm prolongato incrassato; stylus 1.5 × 0.3 mm ca. 1.2 mm e hypanthio eminens; stigma capitellatum 0.6 mm diam; ovarium 3-loculare multispermum 2/3-inferum glabrum apice in conum 0.2 mm altum elevatum; semina 0.6 × 0.4 mm minutissime tuberculata.

Type. Inflorescence branches and hypanthium red-tinged, petals and stamens white, locally frequent on dry side of middle falls of Río Tirica below Summit Camp, Chimantá Massif, Edo. Bolívar, Venezuela, alt. 1760 m, 1 Mar 1955, *J. A. Steyermark & J. J. Wurdack 1226* (holotype US 2342416). Paratypes. VENEZUELA, Edo. Bolívar. Chimantá Massif: upper slopes of Apácara-tepuí, alt. 1700–1850 m, *Steyermark 75829;* Torono-tepuí, alt. 1895–1910 m, *Steyermark & Wurdack 1074;* Agparaman-tepuí, alt. 1880–1955 m, *Steyermark & Wurdack 1129.*

Heterostyly has long been suspected in the minute-flowered Andean species of *Miconia* Sect. *Cremanium,* but the inconspicuous (described) morphologic differences and lack of field observations have prevented acknowledgment of this phenomenon. In *M. dioica,* there seems no doubt as to heterostyly and, judging by the individual collections, dioecism; the type collection is male, *Steyermark 75829* is fruiting, and the other two paratypes are female flowering and fruiting. *M. manicata,* from the Colombian Andes, has elliptic ciliolate leaf blades, manicate branchlet nodes but with petioles simply inserted on the stems above the nodal elevation, and somewhat larger flowers (petals 1.8 mm long and anthers 1.3 mm long); the anthers are basally 4-celled as in the Guayana species. In Cogniaux' monograph, *M. dioica* would key to *M. tinifolia* Naud. or *M. pinetorum* Naud., both of which have larger flowers and lack elevated cauline nodes. Jamaican material of *M. rubens* (Sw.) Naud. (*Nichols 108, Eggers 3622*) shows a very slight tendency towards nodal development and perhaps dioecism (or surely heterostyly), but has oblong-elliptic serrulate leaf blades. In general habit, *M. dioica* resembles *M. sarmentosa* Cogn. of French and Dutch Guiana.

M. rupestris Ule was described as with 2-pored anthers; however all recent material from Roraima, Ilu-tepuí, the Chimantá Massif, and Auyán-tepuí, agreeing with Ule's and Gleason's descriptions and the type photographs in minute details (quadrangular stems, with caducous spinules), shows 4-pored anthers. Apart from the purported 2-pored anthers, all of the features of *M. rupestris* may be found within the many varieties of *M. theaezans* (Bonpl.) Cogn. (cf. var. *subtriplinervia* Cogn., var. *tetragona* Cogn., var *triplinervia* Cogn.); accordingly, I have referred nine collections from the four Venezuelan tepuís to *M. theaezans.* As for material from Roraima and Ptari-tepuí ascribed to *M. tinifolia* Naud., I feel sure that it is at least subspecifically distinct from Andean collections, but am deferring any adjustment until the Andean population is studied in detail. A recent collection from Cerro Yutaje (*Maguire & Maguire 35329*), fruiting only, seems also involved in the *M. theaezans-M. tinifolia* problem, having distinctly

5-nerved cordulate leaf blades; flowering material is required to establish the firm identity of the Yutaje shrub.

Tococa guianensis Aubl. var. **orinocensis** Wurdack, var. nov.

Rami modice vel densiuscule setosi, pilis eglandulosis fuscis 5–10(–15) mm longis gracilibus laxis. Hypanthium modice vel densiuscule setosum, pilis fuscis 2–3 mm longis gracilibus eglandulosis.

Type. Shrub 0.7–1.5 m, petals pink, fruit reddish, frequent along moist edge of Sabana Huachapana, Río Orinoco 30 km above Santa Barbara, Terr. Amazonas, Venezuela, alt. 125 m, 15 Sep 1957, *Bassett Maguire, John J. Wurdack, & William M. Keith 41468* (holotype US 2342579). Paratypes. VENEZUELA, Terr. Amazonas. Río Orinoco: just west of Santa Barbara at junction of Ríos Orinoco and Ventuari, alt. 125 m, *Cowan & Wurdack 32028;* Sabana de Atures, alt. 120 m, *Llewelyn Williams 15935* (VEN). Río Ventuari: Sabana de Moyo on south bank of Río Ventuari 15 km above mouth, alt. 150 m, *J. S. Level 33.* Edo. Bolívar. Río Orinoco: morichal 2 km east of river near Cerro Gavilan (Cerro Carichana), alt. 100 m, *Wurdack & Monachino 39937.*

Nowhere in *T. guianensis* or its satellite species (*T. spruceana* Cogn., *T. occidentalis* Naud., *T. latifolia* Naud., *T. formicaria* Mart.), including the more-recently described taxa discussed by Gleason (Bull. Torrey Club **58**: 250–251. 1931) does the above diagnostic combination along with very large spheroidal formicaria occur; setulose hypanthia (the hairs usually gland-tipped) are found in various units. The variability loci in the geographically discontinous rassenkreis are both too involved and incompletely studied for elaboration here (i.e. both time and complexity have me stymied for now).

Tococa egensis Naud.

T. glandulosa Gleason, Bull. Torrey Club **58**: 252. 1931.

Klug 424 and *Asplund 14596* cannot be distinguished from the Poeppig collections (*2549, 2790, Addenda 180,* W); all have (despite Cogniaux' description) styles moderately puberulous with slender hairs and the minutely conical ovary apex with about 10 delicate glandular setae 1–1.5 mm long. To *T. egensis,* I have tentatively referred a large series of Amazonas (Venezuela) specimens with sparsely glandular-setulose external calyx teeth up to 4 mm long and sparsely glandular-setose hypanthia. I seriously doubt that *T. longisepala* Cogn. should be maintained apart from *T. egensis;* although the Spruce type collections (K, W) show no trace of hypanthial or calycine setae, there seem to be no other differences from the Venezuelan material. The establishment of subspecific status for *T. longisepala* under *T. egensis* would require critical examination of prior-named species—*T. coronata* Benth. and *T. truncata* Benth.—as well as the species of *Tococa* Sect. *Anaphysca* with puberulous styles and ovaries.

Tococa obovata Gleason subsp. **neblinensis** Wurdack, subsp. nov.

Folia supra bullis setiferis pustulata subtus foveolata.

Type. Shrub to 1 m, stems and lower leaf surface red-tinged, hypanthium maroon, petals outside 1/2-white and 1/2-pink, inside pink, frequent at Cumbre Camp, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 1800 m, 12 Nov 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 42055* (holotype US 2342602). Paratypes. VENEZUELA, Terr. Amazonas. Cerro de la Neblina:

cumbre, *Maguire, Wurdack, & Bunting 37038, 37118, 37305, 37330, Maguire, Wurdack, & Maguire 42270.*

In the typical subspecies, the upper leaf surface is plane with slender-based hairs, while the lower surface is plane or with minute protuberances at the upper surface hair insertion points; in subsp. *neblinensis*, each upper surface hair insertion point is marked on the lower leaf surface by a prominent indentation. The mature flowers in the Neblina collections increase somewhat the bud dimensions as described by Gleason; petals are 21 × 9 mm, filaments 8.5 mm long, anthers 6.2 mm long, and style 17 × 1 mm. There seems no reason for the separation of *T. montana* Gleason from *T. obovata*, the characters cited in the original description either being minute quantitative ones or not holding for the type specimens. The young stems and lower leaf surface veins of *Tate 593* are sparsely setose; the hypanthial setae of *Tate 1009* are in part gland-tipped and the sepals are only about 2.5 mm long (rather than 4 mm cited in the original description). Two sprigs of *37330* and two of *42055* show development of spherical formicaria 0.5–1 cm long on a few of the leaves; this must be of infrequent occurrence, judging by the many duplicates of most collection numbers without formicaria.

Tococa erythrophylla (Ule) Wurdack, comb. nov.

Miconia erythrophylla Ule, Notizbl. Bot. Gart. Berlin **6**: 357. 1915.

T. erythrophylla is closely related to *T. nitens* (Benth.) Triana, differing in the dull red-flushed leaf blades with plane secondary and tertiary lower leaf surface veins, as well as the ventro-terminal anther pore. *T. nitens* has glossy green leaf blades with prominently elevated-reticulate lower surface veinlets and the anther pore slightly tipped dorsally. Pubescence quantity is quite variable in both species. In *Ule 8679* (ex photo) and two recent British Guiana collections (*Tillett, Tillett, & Boyan 43984, 45053*), the leaves are glabrous and eciliate, although minutely crenulate-serrulate. Among the numerous recent Chimantá Massif and Auyán-tepuí specimens, the leaf blades are caducously ciliolate-serrulate with surfaces varying from glabrous to sparsely lax-setulose. There apparently is a general correlation with habitat, the slope forest and cumbre scrub forest collections being the most pubescent; the pubescence transition is so gradual that no nomenclatoral recognition seems feasible. *T. desiliens* Gleason differs from *T. erythrophylla* in the gland-tipped stem, inflorescence, and hypanthium hairs and relatively broader leaf blades. *T. cinnamomea* Triana has the leaf blade bases rounded and nearly peltate on the petiole apex, as well as anther pores tilted dorsally.

Tococa erioneura (Cogn.) Wurdack, comb. nov.

Miconia erioneura Cogn. Mem. Torrey Club **6**: 38. 1896.

Certainly the near relatives of this Bolivian species are in *Tococa* Sect. *Anaphysca*, the closest being the next-described species. Cogniaux suggested *Miconia schlimii* Triana as a relative; however, the complete lack of simple hairs, non-pruinose petals, and almost completely inferior 5-celled ovary negate close affinity with *T. erioneura*.

Tococa tepuiensis Wurdack, sp. nov.

Sect. *Anaphysca*. *T. erioneurae* (Cogn.) Wurdack affinis sed foliorum laminis latioribus subtus pilis glanduliferis intermixtis.

Arbor 4–12 m; rami obtuse sulcato-quadrangulati demum teretes inflorescentiaque primum sparsissime laxo-setulosi mox glabrati ad nodos caduce pinoideo-furfuracei. Folia in dimensionibus vix disparilia; petioli 6–17 cm longi supra modice brevi-setosi pilis laxis; lamina 15–35 × 9–20 cm oblongo-elliptica vel ovato-elliptica basi late obtusa vel rotundata crasse membranacea, subtus in venis venulisque modice vel dense et in superficie sparse longo-setulosa vel brevisetosa pilis tenuibus sublaxis p. p. glanduliferis glandula oblonga nigra, breviter 5–7-plinervata nervis duobus interioribus 3–15 mm supra basim insertis, ad margines inconspicue crenulato-serrulata et modice ciliolata. Panicula 10–15 cm longa anguste oblonga ramis inferioribus ca. 1.5 cm longis paucifloris ad nodos bracteatis bracteis bracteolisque 1.5–2 mm longis setiformibus vel lanceolatis glanduloso-setiferis subpersistentibus; pedicelli crassi 0–5 mm longi, bracteolis ad hypanthii basim insertis; flores 5-meri. Hypanthium 7 mm longum glabrum; calycis tubus 1 mm altus extus sparsissime glanduloso-setulosus, lobis interioribus 0.5 mm altis obverse ellipticis glabris extus planis vel ad basim minutissime unituberculatis. Petala 7.5–9 × 6.5–7 mm asymmetrice obovata apice emarginata densiuscule granuloso-pruinosa. Stamina isomorphica glabra; filamenta 7–7.5 mm longa; antherae 6.5–7 mm longae apice ventraliter incurvatae poro ventraliter inclinato. Stylus 10 × 1 mm apicem versus ad 1.5 mm clavatus glaber; stigma 1.5 mm diam.; ovarium 3-loculare 1/4-inferum apice truncatum glabrum.

Tococa tepuiensis Wurdack subsp. **tepuiensis.**

Lamina apice graditer acuminata supra sparse breviterque setosa pilis laxis p. p. caduce glanduliferis.

Type. Tree 10 m with slender trunk, leaves membranous, dull green above, paler green beneath with raised nerves, calyx pale green, petals in bud white with pink tinge, anthers on one side, curved, dull white, the connective brownish, filaments dull mauve, forested middle slopes near Río Tirica, Agparaman-tepuí, Chimantá Massif, Edo. Bolívar, Venezuela, alt. 1365 m, 5 Mar 1955, *J. A. Steyermark & J. J. Wurdack 1261* (holotype US 2342419). Paratypes. VENEZUELA, Edo. Bolívar. Chimantá Massif: escarpment base, Torono-tepuí, *Steyermark 75515-A;* forested slopes of Abácapa-tepuí, *Steyermark 75184.* Terr. Amazonas. Cerro Yutaje: Caño Yutaje, alt. 1500 m, *Maguire & Maguire 35350.* Cerro de la Neblina: slope forest, alt. 700 m, *Maguire, Wurdack, & Maguire 42026.* Sierra Parima: headwaters of Río Siapa and Rio Padauiri, Brazilian boundary, alt. 1340 m, *F. Cardona 1509.*

Tococa tepuiensis Wurdack subsp. **glabrata** Wurdack, subsp. nov.

Lamina apice hebeti-acuta supra glabra.

Type. Tree 4–5 m, buds pink, occasional on upper escarpment slopes east of Camp 3, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 1700 m, 27 Dec 1953, *Bassett Maguire, John J. Wurdack, & George S. Bunting 36918* (holotype US 2342540).

T. erioneura has completely eglandular lower leaf surface hairs and a blade length/width ratio of 3–4 rather than 2–2.5; the flowers of both species show no differentiating characters. Other close relatives of *T. tepuiensis* include *T. desiliens* Gleas. (with glandular-setose stems, inflorescence, and hypanthium) and *T. cinnamomea* Tr. (with non-glandular hairs, basally nerved leaf blades, and dorsally tilted anther pores). Both *T. subciliata* (DC.) Tr. and *T. planifolia*

Benth. differ at least in the basally tapered hypanthia, more prominent external calyx teeth, and pubescent ovaries.

Maieta neblinensis Wurdack, sp. nov.

A *M. guianensi* Aubl. et *M. poeppigii* Mart. ex Tr. differt hypanthiis distincte 10-alatis alis glandulifero-setosis inter alas glabris.

Frutex 1–3 m in partibus juvenilibus furfuraceis tomento mox deciduo; rami teretes petiolisque modice glanduloso-setosi pilis ca. 1.5 mm longis. Folia disparilia membranacea supra sparse glanduloso-setulosa subtus in venis modice brevi-setosa in venulis superficieque sparse vel sparsissime glanduloso-setulosa ad margines undulato-serrulata et glanduloso-ciliolata. Folia maiora: petioli 0.5–1.3 cm; lamina basi vesiculifera; vesica 2–3 cm longa oblonga modice longo-setulosa pilis glanduliferis; lamina expansa 15–28 × 6.5–12 cm oblongo-elliptica apice per 1–2 cm subabrupte angusteque acuminata basi acuta vel obtusa 5-plinervata nervis primariis interioribus subtus formicarii membrana ca. 2 cm coalitis. Folia minora: petioli 0.5–1 cm; lamina 4.5–15 × 2.5–6 cm elliptico-ovata vel oblongo-elliptica apice breviter (0.5–2 cm) subabrupteque acuminata basi obtusa vel rotundata vesicis destitutis vel ad laminae basim 0.5–1 cm longis rotundatis 3–5-nervata vel ad 0.5 cm 5-plinervata. Inflorescentiae in foliorum superiorum axillis 1–4-fasciculatae 1–2(–3)-florae; pedunculus 0.4–2.5 cm longus compresso-quadrangulatus in angulis glanduloso-setulosus; bracteae ca. 3 mm longae subulatae ad pedunculi apicem insertae sparse glanduloso-setulosae tarde caducae. Pedicelli 3–5 mm longi clavati compresso-quadrangulati in angulis glanduloso-setulosi; bracteolae 1–1.5 mm longae triangulares acuminatae glabrae ad hypanthii basim insertae persistentes. Flores 5-meri. Hypanthium (ad torum) 6.5 mm longum 10-alatum alis 0.2 mm altis modice glanduloso-setulosis setulis 1–1.5 mm longis basi expansis plusminusve caducis alioqui glabrum; calycis tubus 1 mm altus, lobis interioribus inconspicuis 0.4 mm altis obverse ellipticis apice rotundatis minutissime glanduloso-ciliolatis, dentibus exterioribus 2 mm eminentibus linearibus apice seta unica glandulifera 1 mm longa terminatis. Petala 7–7.5 × 4.2–6 mm obovato-oblonga apice vix emarginata apicem versus ad margines inconspicue erosa. Filamenta 6 mm longa ca. 4.5 mm supra basim ventraliter cum glandula sessili; antherarum thecae 7.5–8.5 mm longae oblongae curvatae convolutae basi sub filamenti insertionem per 1.1–1.3 mm bifidae apice dorsaliter poro 0.3 mm diam. Stylus 9 × 0.8 mm; stigma expansum 1.5 mm diam; ovarium 5-loculare 1/2-inferum apice per 2 mm liberum truncatum minutissime sparseque glanduloso-puberulum. Bacca ca. 1–1.3 cm longa oblongo-sphaeroidea; semina 0.8 × 0.4 mm pyramidata laevia.

Type. Flowers white, fruit purple-black, abundant in talus forest between Camps 3 and 4, Cerro de la Neblina, Terr. Amazonas, Venezuela, alt. 700–800 m, 7 Nov 1957, *Bassett Maguire, John J. Wurdack, & Celia K. Maguire 41993* (holotype US 2342597). Paratypes. VENEZUELA, Terr. Amazonas. Cerro de la Neblina: vicinity of Camp 3, alt. 650–1200 m, *Maguire, Wurdack, & Bunting 36810, 36876;* Cañon Grande SSW of Cumbre Camp, alt. 1100 m, *Maguire, Wurdack, & Maguire 42491.*

Both relatives have terete hypanthia with glandular setae evenly distributed over the surface. *M. guianensis* has 2–3 pairs of more-or-less coalesced bracteoles at the hypanthium base, rather than a single pair as in *M. neblinensis,* while *M. poeppigii* has stellulate-furfuraceous bracteoles and hypanthium as well as

more prominent glandular-ciliolate external calyx teeth. The external teeth of the Neblina species are rather fragile and often broken off at anthesis.

Myrmidone lanceolata Cogn.

Of Cogniaux' criteria for separation of this species from the common *M. macrosperma* Mart., the only consistent character seems to be the rather persistent rufo-furfuraceous tomentum (consisting of few-armed stellate hairs and clavate glands) on the branchlets and hypanthium. In *M. macrosperma,* the hypanthium is nearly or quite glabrous except for the long ± gland-tipped setae, while the stem tomentum is limited to the nodes and lower leaf surface base (although sometimes extending in lines for a short distance below the nodes). In *M. lanceolata,* the tomentum is evenly distributed on young hypanthia and evenly covers the branchlets on all sides (being tardily deciduous). The ovary apex in *M. macrosperma* is sparsely to moderately setulose while the recent collections of *M. lanceolata* show densely setulose ovaries, the hairs in both species being in part simple and gland-tipped or with 1–3 arms from the base. I have examined the Kew syntype (*Spruce 2336*) of *M. lanceolata,* which is in bud (as were apparently the sheets seen by Cogniaux). The only recent collections truly comparable with the original Spruce specimens are *Maguire, Cowan, & Wurdack 29956,* from the slopes (elev. 800–1100 m) of Cerro Huachamacari, and *Maguire, Wurdack, & Bunting 36805,* from the lower slopes of Cerro de la Neblina (alt. 200–650 m). Apart from numerous lowland collections in Guayana, *M. macrosperma* is also known from the Neblina slopes, alt. 650–700 m (*Maguire, Wurdack, & Bunting 36817*).

Clidemia heptamera Wurdack, sp. nov.

A congeneribus vesiciferis differt floribus plerumque 7-meris.

Frutex 0.5–1.5 m; rami teretes cum foliorum venis subtus petiolis formicariisque modice pilis barbellatis debilibus ad 0.5 mm longis obsiti et dense vel modice glanduloso-setosi pilis laevibus plerumque 2–4 mm longis, ad nodos et in petiolis supra dense appresso-setosi pilis barbellatis 1.5–3 mm longis stramineis. Folia plerumque disparilia, in superficie supra modice strigosa pilis laxis glanduliferis 1–2.5 mm longis subtus sparse glanduloso-setosa ad margines crenato-serrata dentibus ca. 1 mm profundis et 2–3 mm inter se distantibus. Folia maiora ad petioli apicem vesiculifera; petioli (vesicis exclusis) 0.4–2 cm longi; vesicae 1.5–3 cm longae oblongae vel elliptico-oblongae; lamina 11–20 × 6–12 cm elliptica vel ovato-elliptica apice breviter (ad 1.5 cm) hebeti-acuminata basi ad 7 mm cordata 7- vel sub-9-nervata. Folia minora vesica destituta vel vesica ad 1.3 cm longa armata; petioli (vesicis exclusis) 0.2–1.2 cm longi; lamina 4–11 × 2.5–7 cm late elliptica apice ca. 0.5 cm hebeti-acuminata basi rotundata vel ad 4 mm cordata 5–7-nervata. Inflorescentiae in foliorum superiorum axillis 1–2-fasciculatae 1–2-florae. Pedunculus ad 5 mm longus cum pedicellis hypanthiisque modice vel dense pilis barbellatis ad 0.4 mm longis obsitus ad nodos pilis barbellatis ad 1.5 mm longis dense armatus; pedicelli 6–9 mm longi; bracteolae 1–1.2 × 0.3 mm lanceolatae strigulosae ca. 0.5 mm infra hypanthium insertae persistentes; flores (6–)7-meri. Hypanthium (ad torum) 3 × 4 mm; calycis tubus 0.3 mm altus, lobis interioribus 1.1 × 1.9 mm late ovatis apice rotundatis ad margines lacerato-ciliolatis, dentibus exterioribus lobos interiores aequantibus 1–4 setis glanduliferis ca. 1 mm longis armatis. Petala 6.5–7 × 3–4 mm obovato-oblonga apice 1–2 setulis glanduliferis armata ad margines apicem versus vix erosa. Stamina glabra

isomorphica; filamenta 2.8–2.9 mm longa; antherarum thecae 2.7 mm longae vix curvatae obscure convolutae apice centraliter uniporosae, poro 0.1–0.15 mm diam, connectivo non prolongato basi dorsaliter dente oblongo hebeti interdum cum setula 0.2–0.3 mm longa terminato. Stylus 4.5 × 0.4 mm; stigma expansum 0.7 mm diam; ovarium 3-loculare 3/4-inferum apice in collum lobulatum 0.2 mm altum sparsissime glanduloso-setulosum (setulis 0.1 mm longis) circum stylum protractum. Semina numerosa vix immatura 0.6 × 0.3–0.35 mm obcuneata dense prominenterque muriculata.

Type. Buds white, fruit red, frequent on slopes of Mt. Ayanganna, Pakaraima Mts., British Guiana, alt. 1000–1500 m, 5–6 Feb 1955, *Bassett Maguire, W. M. C. Bagshaw, & Celia K. Maguire 40572* (holotype US 2342568). Paratypes. BRITISH GUIANA, Pakaraima Mts. Membaru-Kurupung trail: alt. 1000 m, *Maguire & Fanshawe 32352.* Mahdia River valley; Mt. Ebeni, alt. 700 m, *Maguire 32120.* VENEZUELA, Edo. Bolívar. Cerro La Danta: headwaters of Río Venamo, alt. 1040–1060 m, *Steyermark & Nilsson 37.* Chimantá Massif: Abácapa-tepuí, *Steyermark 74818.*

Of the 10 available flowers in the various collections, 7 were 7-merous and 3 were 6-merous. In overall features, no other species of *Clidemia* is suggestive of very close relationship with *C. heptamera.* Among the myrmecophilous species, perhaps the 5-merous *C. heterophylla* (Desr.) Gl. and *C. juruensis* Pilger are closest, but neither has the barbellate (not stellate) hairs of the Guayana species. The flowers suggest no close affinity with *Myrmidone, Maieta, Microphysca,* or *Tococa;* the barbellate hairs are approximated in the anomalous and heterogenous *Tococa* species-group of *T. broadwayi* Urb., *T. grandifolia* Standl., *T. spadiciflora* Tr., and *T. platyphylla* Benth., all of which show no inflorescence or floral resemblance to *C. heptamera.*

Clidemia siapensis Wurdack, sp. nov.

A speciebus 26–33 Monographiae Cogniauxii differt foliis planis supra et subtus modice stellato-puberulis pilis glandulosis sparsissime intermixtis.

Frutex 1–2 m; ramuli teretes petiolis inflorescentiisque dense pilis stellatis sessilibus vel usque ad 2 mm stipitatis obsiti pilis glanduliferis ca. 0.3–0.5 mm longis sparse intermixtis. Folia in dimensionibus vix disparilia; petioli 1.5–4 cm; lamina 4.5–16 × 2.8–9 cm oblongo-ovata apice vix (ca. 0.5–1 cm) subabrupteque hebeti-acuminata basi vix (2–4 mm) cordata membranacea supra et subtus modice stellato-puberula pilis ad 0.15 mm stipitatis pilis glanduliferis 0.3–0.7 mm longis sparsissime intermixtis 7- vel sub-9-nervata nervis secundariis ca. 5–8 mm inter se distantibus nervulis non vel vix anastomosantibus ad margines remote crenulato-serrulata (dentibus ca. 2–3 mm inter se distantibus) et sparse patenti-ciliata ciliis caduce glanduliferis. Panicula ad 5 cm longa oblongo-pyramidata submultiflora; flores 5-meri sessiles vel ad 5 mm pedicellati; bracteolae ca. 0.5 mm longae lineares sparse stellato-furfuraceae ad hypanthii basim insertae caducae. Hypanthium (ad torum) 3 × 2.5 mm dense stellato-puberulum pilis sessilibus vel vix (0.1 mm) stipitatis et apicem versus sparse glanduloso-setulosum; calycis tubus 1 mm altus, lobis interioribus 1.5 × 2.5 mm obverse ellipticis apice rotundatis extus dense et intus sparse stellato-puberulis, dentibus exterioribus ca. 0.5 mm eminentibus oblongis modice stellato-puberulis et extus sparse glanduloso-setulosis. Petala 4.5–5 × 3 mm obovato-oblonga apice vix emarginata. Stamina vix dimorphica; filamenta 2.9–3.3 mm longa; antherarum thecae 2.8–3 vel 1.8–2.2 mm lanceolatae vix curvatae convolutae basi rotundatae, connectivo non pro-

longato dorsaliter basi minute (0.1 mm) hebeti-mucronato. Stylus 6–6.5 × 0.4–0.15 mm; stigma punctiforme; ovarium 4-loculare 2/3–3/4-inferum apice 0.5 mm liberum in collum 0.2 mm altum modice stellato-puberulum circum stylum protractum.

Type. Flowers white, occasional at forest edge on granitic laja on right bank of Río Siapa 8 km below Raudal Gallineta (about 100 river km from mouth), Terr. Amazonas, Venezuela, alt. 130–300 m, 20 Jul 1959, *J. J. Wurdack & L. S. Adderley 43519* (holotype US 2342635).

All the suggested relatives of *C. siapensis* have upper leaf surfaces bullate-strigulose or densely strigose with non-stellate hairs; several species are obscurely stellulate-puberulous between the bullae. The anther shape of the Siapa species is like that of *C. strigillosa* (Sw.) DC. and its immediate relatives, rather than resembling that of the *C. novemnervia* species-group. I feel that the synonymization suggested by Gleason (Brittonia **1**: 167. 1932) is excessive; at least *C. pustulata* DC. sensu Cogniaux and R. O. Williams is distinct from the *C. novemnervia* grouping (and perhaps only varietally distinct from *C. strigillosa*). *C. pustulata* is quite suggestive of *C. siapensis*, but has pustulate moderately glandular-setulose upper leaf surfaces, larger stellate hairs, densely glandular-setulose hypanthia, and ovary apices with glandular-setulose as well as stellulate hairs. *C. pustulata* stains the press sheets and to some extent the herbarium sheets yellow, indicating a chemical difference from the non-staining *C. strigillosa*. At least part of *C. neglecta* Don sensu Gleason is actually *C. pustulata;* as noted by Macbride and indicated by the type photograph, the Madrid Ruiz & Pavon material purporting to be *C. neglecta* shows the interrupted-verticillate inflorescence spikes characteristic of *C. capitellata* (Bonpl.) Don, rather than the diffuse panicles of *C. neglecta* sensu R. O. Williams. Central American material studied by Gleason as *C. neglecta* is mixed.

Clidemia capitellata (Bonpl.) D. Don var. **levelii** Wurdack, var. nov.

A var. *capitellata* differt spica contracta 1–1.5 cm longa. A var. *dependenti* (D. Don) Macbr. differt foliis supra et subtus sparse strigulosis.

Type. Arbolito 2 m, flores blancas, Sabana de Moyo on south bank of Río Ventuari 15 km above mouth, alt. 150 m, 5 May 1954, *J. Silverio Level 28* (holotype US 2342385).

Following Macbride's interpretation in the Flora of Peru, typical *C. capitellata* has a spikelike inflorescence 3–8 cm long with interrupted verticels of flowers, while var. *dependens* (as to the Ruiz & Pavón type) has contracted spikes but upper leaf surfaces strigose with hairs 1–2 mm long. The upper leaf surfaces in var. *levelii* are sparsely strigulose, the hairs 0.5–0.7 mm long and 1–2/mm^2. The Venezuelan and Colombian lowland collections which, following Macbride, have been referred to var. *dependens* certainly have longer denser pubescence than the Peruvian type; from Hoehne's description and plate, *C. longisetosa* Hoehne is part of this widespread population. Within all this variability however, var. *levelii* is quite distinct.

Clidemia bullosa DC. Prodr. **3**: 158. 1828.

C. candolleana Cogn. Mart. Fl Bras. 14, pt. **4**: 490. 1888.
C. rariflora Benth. Hook. Jour. Bot. **2**: 308. 1840.
Staphidium pliostemon Naud. Ann. Sci. Nat. III, **17**: 313. 1852.
Clidemia pleiostemon (Naud.) Cogn. DC. Monog. Phan. **7**: 1000. 1891.

C. manoacensis Kränzl. Vierteljahr. Naturf. Gesells. Zurich **76**: 157. 1931.
C. novemnervia (DC.) Tr. var. *depauperata* Pittier. Bol. Soc. Venez. Cienc. Nat. **11**: 23. 1947.

In a comedy of Kew Rule nomenclature errors, Cogniaux displaced DeCandolle's name to accommodate an earlier Sprengel epithet within *Clidemia,* thus necessitating his name *C. candolleana* for the species based on Martius' Pará collection. I have examined the holotype (M) of *C. bullosa* DC.; in one bud, there were 15 stamens, indicating alignment with Bentham's species. The species is quite variable both in density and development of upper leaf surface bullae and in hypanthial pubescence; some of the flowers in the Martius collection (2 sheets) show sparse glandular setae on the hypanthia. *Schultes & Cabrera 19255* and *12581,* from Amazonian Colombia, are good matches vegetatively and reproductively respectively. At present I am inclined to slur over any infraspecific distinctions in this widespread species. For the south Brazilian species [*C. bullosa* (Spreng.) Cogn.], the next available name is *C. biserrata* DC. I have examined isotypes for the taxa proposed by Pittier and Kränzlein; both are pleiostemonous and accord well with Guiana material of *C. rariflora.* All of the four isotypes (NY, US) of *C. manoacensis* (*Rusby & Squires 239,* from the lower Orinoco) have 5-merous flowers with ca. 15 stamens; Kränzlein's vegetative and pubescence details are correct.

Clidemia japurensis DC.

Examination of the holotype (M) of *Leandra heterobasis* (DC.) Cogn. has revealed no difference from the *C. naevula* element of *C. japurensis;* the Martius collection has definitely predominantly 5-merous non-secund flowers and the shorter dense glandular pubescence of *C. japurensis* as defined by Gleason. Since the types of neither *C. japurensis* nor *C. naevula* have been personally studied, the necessary varietal combination will not be made at present; also the correct generic disposition of this widespread but anomalous species is still unsettled. Incidentally, after study of the Martius holotype (M) of *Leandra intermedia* (DC.) Cogn., an excellent match for that rare species is *de la Cruz 2702* (US), from British Guiana; both the holotype and the recent collection are unfortunately fruiting only, but both have predominantly 5-merous fruit with an apically sparsely glandular-puberulous ovary.

Clidemia sandwithii Wurdack, sp. nov.

Ex descriptione et photicone *C. repenti* Tr. affinis sed pubescentia breviore foliorum subtus nervis secundariis evidentibus elevatis.

Caulis scandens radicans teres petiolique modice setulosus pilis 0.3–0.5 mm longis minute barbellatis primum rubris demum brunneis p.p. primum glanduliferis glandulis mox deciduis. Folia opposita non vel vix disparilia; petioli 5–9 mm graciles; lamina 2.5–4.5 × 2–3.3 cm late oblongo-ovata apice per 3–7 mm subabrupte hebeti-acuminata basi rotundata vel truncata coriacea nitida integra, supra glabra, subtus in costa basim versus primum sparse setulosa demum glabrata alioqui glabra, modice ciliolata ciliis barbellatis ca. 0.5–0.8 mm longis, 3–5-nervata venis primariis supra impressis subtus elevatis nervis secundariis supra obsoletis subtus utrinque 8–10 cum tertiariis laxe elevato-reticulatis. Flores in foliorum axillis singuli 5-meri; pedicelli 4–5 mm longi sparse setulosi ca. 2 mm supra basim et ad hypanthii basim bibracteolati; bracteolae lineari-setaceae

1–1.3 mm longae persistentes. Hypanthium 2 mm longum modice (praecipue basim versus) setulosum pilis ca. 0.8–1 mm longis sparse barbellatis; calycis lobi interiores ca. 0.8 mm longi ovato-oblongi, dentibus exterioribus lineari-setaceis sparse setuliferis lobos interiores ca. 2 mm superantibus. Petala ca. 2.3 × 1–1.2 mm oblongo-obovata apice rotundata glabra. Filamenta 1.5 mm longa; antherarum thecae ca. 2 mm longae lineari-oblongae connectivo ventraliter exappendiculato dorsaliter cum appendice hebeti 0.1–0.2 mm longa. Stylus ca. 4× 0.15 mm; stigma truncatum. Fructus baccatus ca. 3 mm diam sphaericus.

Type. Climber in forest, Mt. Kanaima, Potaro District, British Guiana, alt. ca. 450 m, 19 Aug 1959, *B. A. Whitton 104* (holotype K).

The photograph of *C. repens* (Macbride 36352) shows the leaf surfaces and serrulate margins with hairs 1–1.5 mm long and with no development of prominently elevated lower surface venules. The one mature flower of the Whitton specimen was not dissected, all measurements being taken dry. The geographic pairing of *Clidemia* species between the Pacific coast of Colombia and the Guianas also occurs in *C. chocoensis* Wurdack—*C. conglomerata* DC. The general vegetative aspect of *C. sandwithii* is much like that of the two radicant cumbre *Leandra* species. Commemoration of Sandwith's Guianan research is especially pleasurable for one who has been aided both by much personal correspondence and by the example furnished of meticulous taxonomy.

Clidemia pycnaster Tutin subsp. **robusta** Wurdack, subsp. nov.

Foliorum lamina usque ad 8–10 × 4–5 cm supra primum modice brevistrigosa; calycis lobi interiores 1.7 × 1.3 mm oblongi apice rotundati.

Type. Shrub 1.5 m, young fruit mealy, pinkish, rare in scrub savanna, Samwarakna-tipu (Holi-tipu), Kamarang River—Wenamu Trail, Pakaraima Mountains, British Guiana, alt. 1100 m, 10 Nov 1951, *Bassett Maguire & D. B. Fanshawe 32545* (holotype US 2343465).

In the typical subspecies, the largest leaves are 3–3.3 cm wide and only very sparsely strigulose above when young; the triangular usually acute inner calyx lobes are only 1–1.2 mm long. Within the collections of subsp. *pycnaster* studied by me, about 20 per cent of the flowers were 5-merous. In subsp. *robusta*, only 7 of 28 observable flowers were 4-merous, the remainder 5-merous. The ovary of *C. pycnaster* is 3-celled, with the apex very minutely glandular-setulose as well as very sparsely to moderately stellulate-puberulous (and not glabrous as cited in the original description); the torus is sparsely glandular-setulose.

Clidemia morichensis Wurdack, sp. nov.

C. involucratae DC. affinis sed foliis rigidiusculis 5–7-nervatis basi vix cordatis bracteis ovatis.

Frutex 1 m; rami teretes petiolis pedunculisque dense setulosi pilis ca. 1 mm longis plerumque glanduliferis. Petioli 7–18 mm; lamina 5–11 × 2.5–5.5 cm anguste ovata apice anguste acuta basi vix (2–4 mm) cordata rigidiuscula, supra modice strigulosa pilis glanduliferis sparse intermixtis, subtus in venis dense et in superficie modice vel sparse setulosa pilis glanduliferis sparse intermixtis, 5–7-nervata nervis secundariis plerumque 2–4 mm inter se distantibus tertiariis vix inconspicuis, ad margines denticulata et glanduloso-ciliolata. Inflorescentia capituliformis 1–2 cm pedunculata involucrato-bracteata capitulo multifloro; bracteae exteriores duae 8–10 × 5–7 mm ovatae acutae modice gracili-setulosae pilis p.p. glanduliferis, interiores 4–6 vix minores; flores 5-meri. Hypanthium (ad torum) 3.8–4 mm longum subsericeo-strigosum; calycis tubus 0.2 mm altus, lobis interioribus 1.5 mm longis ovatis rotundatis ciliolatis, dentibus exterioribus 1.5 mm eminentibus lineari-lanceolatis setosis pilis p.p. glanduliferis. Petala 3.8–4.2 × 2.6–2.7 mm oblongo-obovata apice rotundata glabra eciliata. Stamina isomorphica glabra; filamenta 2.3–2.8 mm longa; antherarum thecae 2.8–3 mm longae lanceolatae poro apicali, connectivo basi non prolongato exappendiculato. Stylus 7.5 × 0.25 mm; stigma truncatum; ovarium 3-loculare 1/4–1/3-inferum apice in collum 0.3–0.4 mm altum circum stylum protractum collo cum setulis 10 glanduliferis 0.5 mm longis armato.

Type. Leaves very viscid, flowers greenish white, occasional on lower east slope of Cerro Moriche, Río Ventuari, Terr. Amazonas, Venezuela, alt. 200–300 m, 16 Jan 1961, *Bassett Maguire, R. S. Cowan, & J. J. Wurdack 30971* (holotype US 2342445). Paratype. VENEZUELA, Amazonas. Cerro Moriche: east slope, alt. 300–800 m, *Maguire, Cowan, & Wurdack 30864.*

In *C. involucrata*, the leaf blades are shortly plinerved, much less densely pubescent, and acute to rounded (but not cordate) at the base; the floral bracts are linear to lanceolate. In general aspect, especially in the inflorescence form, *C. morichensis* is like *C. capitata* Benth.; that eastern Guayana species is eglandular, with predominantly 4-merous flowers, and with the ovary apex only very shortly glandular-setulose. The inflorescences of *C. morichensis* are borne one per branchlet from an upper leaf axil.

Clidemia alternifolia Wurdack, sp. nov.

C. flexuosae (Tr.) Cogn. affinis sed foliis alternis integris marginibus exceptis glabris floribus breviter pedicellatis.

Rami teretes glabri. Folia ut videtur alterna uno abortivo ca. 1 mm longo; petioli 0.5–1 cm; lamina (acumine excluso) 6–8 × 2–3.5 cm elliptico-lanceolata apice per 2–3 cm caudato-acuminata basi obtusa membranacea trinervata (jugo exteriori irregulari excluso) nervis primariis in acumine coalitis nervulis subtus creberrime reticulato-elevatis glabra, ad margines integra et patento-ciliolata pilis p. p. glanduliferis demum plusminusve deciduis. Flores in foliorum axillis solitarii vel bini 4-meri; pedunculus communis ad 2 mm longus; pedicelli 1–1.5 mm longi glabri; bracteolae 0.6 mm longae lanceolatae appressae glabrae 0.4 mm infra hypanthium insertae. Hypanthium (ad torum) 2.2–2.5 mm longum modice glanduloso-setulosum pilis gracilibus ca. 1 mm longis; calycis tubus 0.2 mm altus, lobis interioribus 0.4–0.5 mm longis rotundatis, dentibus exterioribus 0.4–0.5 mm eminentibus lanceolatis acutis glabris. Petala 2 × 0.5–0.7 mm oblonga apice rotundata extus subapicaliter glanduloso-setulosa setulis 1–2 et 0.5 mm infra apicem dorsaliter insertis. Stamina isomorphica glabra; filamenta 1.8 mm longa; antherarum thecae 1.1 mm longae curvatae oblongae apice dorsaliter minute uniporosae. Stylus 4.5 × 0.2 mm glaber; stigma vix expansum 0.25 mm diam; ovarium 4-loculare omnino inferum apice sparse granuloso-furfuraceum et in collum 0.35 mm altum circum stylum protractum. Bacca globosa teres; semina 1 × 0.3–0.6 mm pyramidata vel curvato-pyramidata minutissime irregulariterque muriculata.

Type. Flowers white, fruit nigrescent, locally frequent in high forest along trail to Guzman Blanco 1–5 km southeast of Maroa, Río Guainía, Terr. Amazonas, Venezuela, alt. 120–140 m, 9 Oct 1957, *Bassett Maguire, John J. Wurdack, & William M. Keith 41777* (holotype US 2342589). Paratypes. VENEZUELA, Terr. Amazonas. Caño Temi: Yavita, *Llewelyn Williams 13980.* Río Negro: San Carlos, *Llewelyn Williams 14518.*

C. flexuosa has reniform or cordate small leaves, sinuate-margined large leaves, stellate-puberulent and setose branches, and sessile (with pedicel less than 0.2 mm long) flowers. Of the 4-merous species of Sect. *Calophysoides,* only *C. semijuga* (Gleas.) Wurdack shows as complete a degree of leaf abortion as *C. alternifolia;* that species, however, has eciliate leaf blades, well-developed inflorescences, glabrous hypanthia, stamen connectives with a dorsal appendage, and costate fruit.

Clidemia pakaraimae Wurdack, sp. nov.

Sect. *Sagraea. C. cymiferae* Donn. Sm. affinis sed foliis maioribus paniculae ramis crassis hypanthiis non stellulato-furfuraceis ovario omnino infero.

Rami primum quadrangulares demum compresso-quadrangulares infra nodos tumidi vesicis binis vel solitariis 1–2 cm longis 0.5–1 cm altis hypanthiis petioliisque non setosis vel primum sparsissime glanduloso-setosis demum glabratis petiolis foliis juvenilibus inflorescentiis hypanthiisque dense appresseque resinoso-furfuracei tarde laeves. Petioli 6–12 cm; lamina 15–28 × 9–21 cm ovata apice per 1.5–2.5 cm graditer acuminata et apiculata basi 0.5–2.5 cm cordata tenuiter coriacea, supra et subtus non setulosa ad margines integra et ciliolata pilis appressis ca. 0.5 mm longis 0.3–0.5 mm inter se distantibus, 7- vel sub-9-nervata nervis secundariis 5–8 mm inter se distantibus nervulis supra invisis subtus densiuscule reticulatis. Panicula 4–5 cm longa lataque pauciflora ramulis robustis compressis 1–2 mm crassis; bracteae bracteolaeque 1–3 mm longae triangulares acutae persistentes; pedicelli 1–3 mm longi robusti; flores 4-meri. Hypanthium 4 mm longum; calycis tubus 1 mm altus, lobis interioribus 0.5 mm altis oblatis apice rotundatis, dentibus exterioribus 0.8 mm eminentibus linearibus crassis hebeti-acutis vel setuloso-apiculatis; torus non setulosus. Petala 7 × 3.3–3.5 mm obovato-oblonga apice truncato-rotundata. Stamina isomorphica glabra; filamenta 4.5–4.8 mm; antherarum thecae lineares 2.1 mm longae apice retusae poro 0.2 mm diam dorsaliter inclinato, connectivo basi 1–1.2 mm prolongato simpliciter articulato. Stylus 6.5 × 0.5–0.7 mm glaber; stigma 0.8 mm diam capitulatum; ovarium 4-loculare omnino inferum glabrum.

Type. Shrub to 3 m, flowers creamy white, locally frequent in wet forest, Merume Mountain, Partang River, upper Mazaruni River basin, alt. 1140 m, 1 Jul 1960, *Stephen S. Tillett, Carolyn L. Tillett, & Rufas Boyan 43949* (holotype US 2343841).

C. cymifera has leaf blades only 5–12 cm long, slender cyme branches only 0.5 mm diam at most, and a 1/3 superior ovary; the stems, lower leaf surface veins, inflorescence, and hypanthium are stellulate-furfuraceous. Otherwise, the Guatemalan species is quite similar in qualitative floral details. *C. ampla* Cogn. (which is very similar to, if not synonymous with *C. grandifolia* Cogn.) is more distantly related; the young stems and petioles are densely lax-strigulose with roughened hairs, the bracts are setulose-ciliolate, the flowers are much smaller, and the well-developed ovarian collar is apically setulose. I do not know if the nodal swellings of *C. pakaraimae* are genetic or pathologic—the occasional unilateral development suggests the latter. Certainly these inflations differ in appearance from the cauline formicaria of *C. tococoidea* (DC.) Gleason.

C. pakaraimae does not suggest any affinity with *C. coriacea* (Naud.) Cogn. and its close relative, *C. duidae* Gleason; both of these cumbre species have terminal inflorescences and probably should be transferred to *Miconia,* perhaps among the 4-merous species of Sect. *Octomeris.* I have continued to use the later homonym, *C. coriacea* (Naud.) Cogn. (1888), in identifications until the best generic disposition can be found; the name is antedated by *C. coriacea* Naud. (1852) which is *Ossaea coriacea* (Naud.) Tr. From the minute morphologic similarities, I also feel that *Leandra linearis* Gleas. (known only in fruit) is a close relative of the two anomalous species of *Clidemia* and should share their eventual generic fate.

RUBIACEAE [23]

Calycophyllum DC. Prod. **4**: 367. 1830.

In recent years various collections have been made in Venezuela and British Guiana of trees having smooth, shiny, exfoliating, coppery-red or reddish bark. These have been found to belong to the genus *Calycophyllum*. All of them, thus far collected, are related to *C. obovatum* (Ducke) Ducke and *C. acreanum* Ducke, but differ in several respects from these species, as indicated by the following key:

Key to the Species of the *C. obovatum-acreanum* group

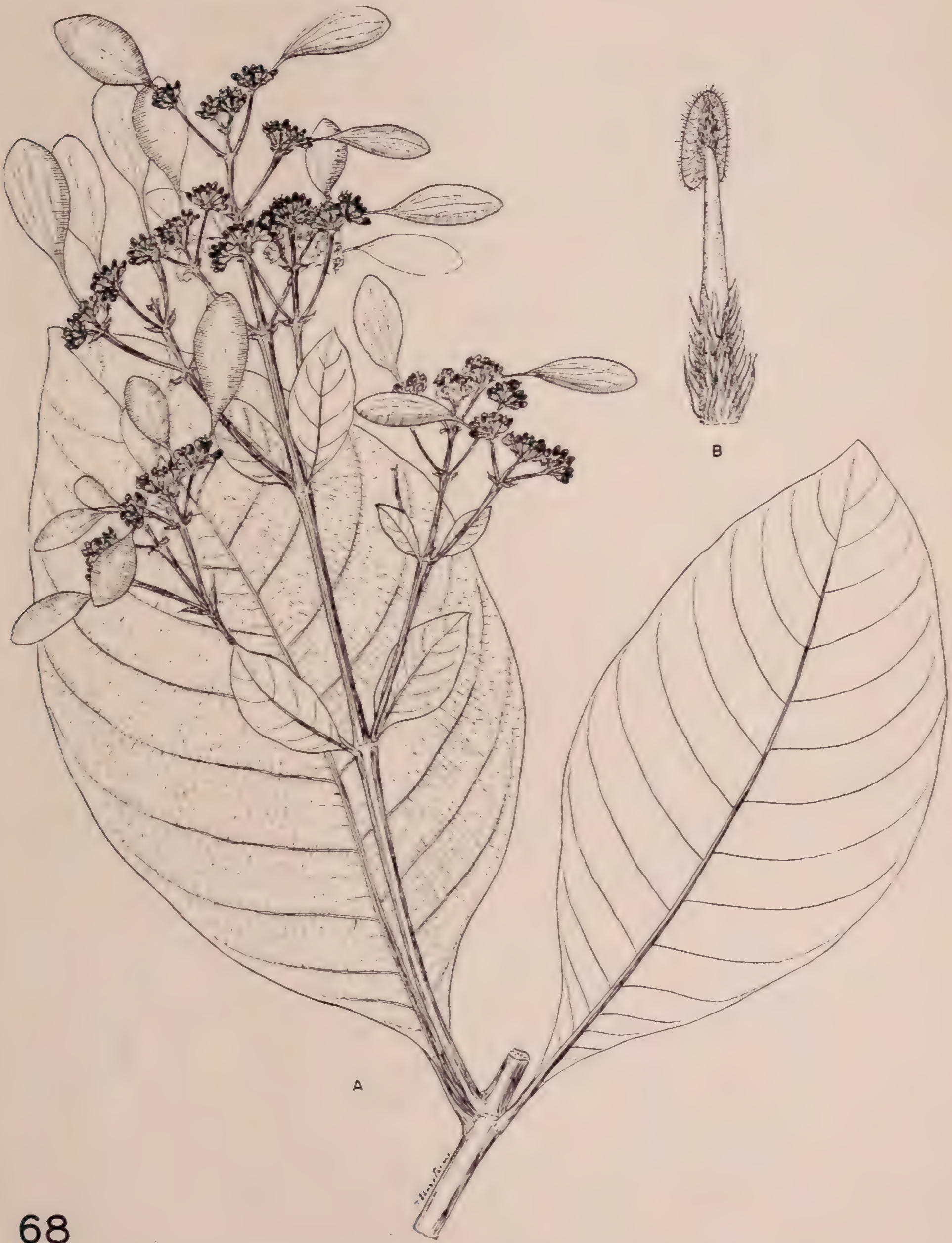
1. Hypanthium, calyx, or capsules glabrous externally; foliar appendage of calyx absent. *C. acreanum.*
1. Hypanthium, calyx, or capsules puberulent externally; foliar appendage of calyx large, showy, petaloid.
  2. Leaves minutely puberulent beneath; anthers pilosulous throughout. *C. intonsum.*
  2. Leaves glabrous beneath; anthers glabrous, or, if pubescent, the pubescence confined to the apex or connective.
    3. Apex of leaf acute to acutish. *C. venezuelense.*
    3. Apex of leaf rounded or very obtuse.
      4. Anther and connective glabrous; corolla hirtellous-pilosulous without, the hairs obviously spreading; bracts of inflorescence at anthesis minute, nearly obsolete, deltoid, 0.5–1 mm long. *C. obovatum.*
      4. Anther shortly pubescent at apex, connective shortly pubescent; corolla glabrous or nearly so without; bracts of inflorescence at anthesis manifest, trifid, or tripartite, or simple, triangular-lanceolate to oblanceolate, 5–12 mm long. *C. spectabile.*

Calycophyllum intonsum Steyermark, sp. nov. Fig. 68.

Arbor 20 m alta, ramulis teretibus superne ad nodos complanatis novellis puberulentibus; stipulis in anthesi non visis; foliis petiolatis, petiolis 1.3–5 cm longis puberulentibus; laminis coriaceis subtus fere concoloribus late elliptico-ovatis vel elliptico-obovatis subacutis vel obtuse acutis 20–27 cm longis 11–15 cm latis supra glabris subtus puberulentibus, nervis lateralibus utroque latere 11–14 prominentibus ante marginem evanescentibus venulis supra creberrimis fere sublineolato-reticulatis; inflorescentiis terminalibus speciosis, rhachi ramulisque tomentellis angulatis compressis 20–30 cm longis 20–27 cm latis, bracteis trifidis vel trilobatis 2–6 mm longis 2 mm latis, lobis lanceolatis vel linearibus lateralibus brevibus acuminatis extus tomentellis ciliolatis; floribus breviter pedicellatis, calycis tubo hypanthioque obconico-subcylindrico 2 mm longo apice 2 mm lato extus cano-tomentello, calycis lobis 4 deltoideis obtusis 0.5 mm longis basi 1 mm latis intus glabris extus dense minuteque tomentello; calycis lacinia foliacea pallide viridi-lutea (teste Tillett) in laminam spatulato-obovatam vel late ovali-oblongam vel ovali-ovatam 2.5–4 cm longam 1–3.2 cm latam utrinque tomentellam dilatati ungui 1–2 cm longo; corolla rubra apice alba (teste Tillett) late campanu-

---

[23] By Julian A. Steyermark.



68

FIG. 68. *Calycophyllum intonsum.* A, habit, × ½. B, stamen, × 10.

lata 5 mm longa, corollae tubo 3 mm longo apice 4.5 mm lato extus ad medium breviter hirtello basi glabrato intus supra basin barbato, lobis 4 suborbicularibus apice rotundatis 1.5–2.25 mm longis 2–2.25 mm latis extus parce puberulentibus intus glabris; staminibus 4, filamentis 4.5 mm longis 0.5 mm latis infra medium dense villosis pilis stramineo-albidis, antheris cano-brunneis (teste Tillett) ovato-oblongis 1.25 mm longis parce vel dense villosulis, connectivo supra villosulo;

disco carnoso 4-lobato; stylo 5 mm longo sulcato glabro stigmate subcapitato; capsulis non visis.

BRITISH GUIANA. On shoulder of Karow-tipu, Upper Mazaruni River basin, Kako River; frequent; mixed-evergreen forest; alt. 950 m; tree to 20 m, 5 dm base diam, bark smooth, red; leaves dark green above, slightly brittle; corolla red with white tip; slight fragrance; 30 Sep 1960, *Stephen S. & Carolyn L. Tillett 45567* (holotype NY, isotype VEN).

This species differs from all the others of the genus, except *C. acreanum*, in the puberulent lower leaf surface, the densely pilosulous anthers and connective, and in the possession of bracts present in the inflorescence, 2–6 mm long and externally tomentulose as well as ciliolate.

From *C. spectabile* Steyerm., also of British Guiana, to which it is related, it differs in the corolla puberulent or tomentulose on the outer surface, the puberulent lower leaf surface, the more pubescent bracts of the inflorescence, and the smaller, narrower, more numerous foliar appendages of the calyx.

Calycophyllum spectabile Steyermark, sp. nov.

Arbor 10 m lata, ramulis novellis puberulentibus; stipulis in anthesi non visis; foliis petiolatis, petiolis 1.5–3.5 cm longis plerumque glabris supremis puberulentibus; laminis coriaceis late obovatis vel ovato-ellipticis apice obtusis basi obtusis 15–35 cm longis 11–24 cm latis utrinque glabris, nervis lateralibus utroque latere 14–15 prominentibus ante marginem arcuato-curvatis venulis supra creberrimis fere sublineolato-reticulatis; inflorescentiis terminalibus speciosis, rhachi ramulisque tomentosis angulatis 15–22 cm longis 20–26 cm latis, bracteis simplicibus triangulari-lanceolatis vel oblanceolatis acuminatis vel trifidis vel tripartitis 5–12 mm longis 1–2 mm latis glabris marginibus ciliatis exceptis; floribus sessilibus vel breviter pedicellatis; calycis tubo hypanthioque obconico extus sericeo-stramineo-tomentello, calycis lobis 4, suborbicularibus apice rotundatis 1–1.25 mm longis 1.5–2 mm latis extus breviter tomentellis; calycis lacinia foliacea pallido-luteis (teste Maguire & Fanshawe) in laminam obovatam vel suborbiculari-obovatam supra medium rotundatam basin versus cuneatam 3.5–6 cm longam 1.8–4.5 cm latam utrinque strigillosam dilatata; corolla alba vel rosea (teste Maguire & Fanshawe) tubo late campanulato 5 mm longo extus glabrato vel parce puberulenti, lobis 1.75–2 mm longis 1.5–2 mm latis; staminibus 4, filamentis villosis, antheris glabris tantum connectivi parte apicali dorsalique pubescenti; capsula non visa.

BRITISH GUIANA. Between Imbaimadai airstrip and Mt. Yamanaik, Upper Mazaruni River; locally frequent; alt. 1200 m; tree 10 m, 20 cm diam; bract pale yellow; flowers white or pink; 23 Oct 1951, *Bassett Maguire & D. B. Fanshawe 32219* (holotype NY, isotype VEN); Kopinang Savanna, Kopinang Falls, southern Pakaraima Mountains; alt. 850 m; 30 Aug 1961, *Bassett & Celia Maguire & G. Wilson-Browne 46018 A* (paratype NY); same locality, 1 Sep 1961, *Maguire, Maguire, & G. Wilson-Browne 46041 A* (paratype NY).

This species is related to *C. intonsum* Steyerm., from which it may be distinguished by the externally glabrous instead of tomentulose corolla, glabrous lower surface of leaves, larger, broader, and relatively fewer foliar appendages of the calyx, and the externally more glabrate and longer bracts of the inflorescence.

Calycophyllum venezuelense Steyermark, sp. nov.

Arbor 8–15 m alta, ramulis teretibus glabris; stipulis caducissimis apicalibus 32–35 mm longis glabris marginibus scariosis; foliis petiolatis, petiolis 1.5–3 cm longis glabris; laminis coriaceis elliptico-ovatis late ovatis vel obovatis apice acutis vel acutiusculis basi cuneatim vel acutate angustatis vel obtusis 18–30 cm longis 6–17.5 cm latis utrinque glabris, nervis lateralibus utroque latere 11–15 valde adscendentibus plerumque rectis utrinque prominentibus venulis supra creberrimis fere sublineolato-reticulatis; inflorescentiis terminalibus speciosis, rhachi ramulisque tomentellis 15–20 cm longis 15–20 cm latis, bracteis simplicibus lanceolatis vel oblanceolatis acutis vel acuminatis vel trifidis vel tripartitis 3–9 mm longis 2–3 mm latis intus glabris extus glabratis vel parce puberulentibus ciliolatis; floribus sessilibus vel subsessilibus; calycis tubo hypanthioque turbinato extus sericeo-cano-tomentello 3–3.5 mm alto, calycis lobis 4 triangularibus suborbicularibus vel late deltoideis apice rotundatis obtusis vel subacutis 1–1.5 mm longis 1.5–1.75 mm latis extus puberulis; calycis lacinia foliacea pallido-viridi vel albida in laminam anguste oblongo-ellipticam vel elliptico-spatulatam apice rotundatam basin versus cuneatam 5.5–7 cm longam 2–3.3 cm latam utrinque puberulentem dilatata, 5–7-nervatam, nervis magis densiuscule puberulentibus, ungui 1–2.5 cm longo puberulenti; corolla albida urceolato-campanulata 5–6 mm longa, tubo 3–4 mm longo 4–5 mm lato extus glabro vel parce minutissime puberulentibus intus supra basin barbato-hirsuto 2 mm aliter glabro, lobis suborbicularibus rotundatis 1.5–1.75 mm longis 2.25–3 mm latis glabris; staminibus 4, filamentis 5.5–6 mm longis 0.5–0.75 mm latis infra medium dense hirsutulis supra medium parce puberulis apicem versus glabris basin versus glabris, antheris ovato-oblongis 1.5 mm longis puberulis, connectivo magis densiuscule puberulis; disco carnoso late 4-lobato 0.5 mm alto 1.8 mm diam; stylo 5–5.5 mm longo glabro, stigmatibus 2 late oblongis apice rotundatis 1 mm longis 0.75 mm latis; capsulis clavato-obconicis 1.5–2 cm longis extus minute hirtellis vel puberulentibus; seminibus fusiformibus utrinque acutis vel acuminatis 6–10 mm longis 1.75–2 mm latis irregulariter eroso-pectinatis stramineis vel castaneis, testa rugoso-reticulata vel submuriculata.

VENEZUELA. Bolívar: Cerro Pauji, vicinity of km 100 south of El Dorado; forested slopes; alt. 800 m; common; tree 10–15 m tall; trunk 2–4 dm diam, with thin exfoliating coppery-red bark; leaves coriaceous, dark green above; bracts of inflorescence pale greenish to white; 6 Mar 1962, *Julian A. Steyermark & Leandro Aristeguieta 4* (holotype VEN, isotype NY); base of Cerro Pauji along Quebrada 94 at km 94 south of El Dorado; low wet woods along trail; alt. 800 m; tree 10 m tall, bark coppery-red; 27 Jul 1960, *Steyermark 86704* (paratype NY, VEN); cerro tabular de El Pauji 100 km sur El Dorado; arbol caracteristico de la zona abierta de laja de escasa vegetación; alt. 500–530 m; arbol pequeño; 21 Mar 1956, *Bernardi 2970* (paratype NY, VEN); alrededores km 88 carretera El Dorado; sitios abiertos y pedregosos; arbol de unos 8–10 m alto; corteza rojiza, muy caracteristica; Nov 1958, *Aristeguieta 3743* (paratype VEN); summit of low pass over summit of Sierra de Lema, headwaters of Río Chicanan; wet forest; alt. 700 m; tree 15 m tall, bark coppery, smooth; 22 Aug 1961, *Steyermark 89397* (paratype VEN); La Escalera, Río Uiri-yuk, Alto Río Cuyuni; montane woodland; alt. 200 m; medium tree, reddish exfoliating bark; floral bracts white; corollas greenish-white, pink-tinged; occasional; 20 Aug 1962, *Bassett Maguire, Julian A. Steyermark, & Celia K. Maguire 46789* (paratype NY, VEN).

This species is most closely related to *C. spectabile* Steyerm. in having the glabrous outer surface of the corolla, pubescent anthers and connectives, and manifest bracts of the inflorescence, but differs from that species in the shape and relative proportions of length and width of the foliar appendage of the calyx. The foliar appendage of the calyx in *C. venezuelense* has a similar shape to that of *C. intonsum*, but that species has the lower surface of the leaf-blades minutely puberulent.

Capirona Spruce, Jour. Linn. Soc. **3**: 200. 1859.

This genus was originally based upon a species collected in Peru by Richard Spruce in 1856 and published as *C. decorticans* in 1859 (Jour. Linn. Soc. **3**: 200. 1859). Subsequently, *C. leiophloea* Ben. (Bull. Mus. Hist. Nat. Paris **27**: 367. 1921) was described from French Guiana, *C. huberiana* Ducke (Arch. Jard. Bot. Rio de Janeiro **3**: 257. 1922) from Brazil, *C. surinamensis* Brem. (Rec. Trav. Bot. Neerl. **31**: 261. 1934) from Surinam, and *C. erythroxylon* Standl. (Publ. Field Mus. Bot. **22**: 48–49. 1940) from Peru.

The extensive recent explorations in Venezuela by Maguire, Wurdack, et al. have revealed the presence of the genus in Venezuela, represented by two collections, at least one of which is an undescribed species.

Capirona wurdackii Steyermark, sp. nov. Fig. 69.

Arbor 8–10 m alta; stipulis intrapetiolaribus magnis subfoliaceis oblongo-oblanceolatis apice subito acutis mucronatis vel subacuminatis integris vel interdum bifidis 2.5–4.5 cm longis 1.5–2 cm latis connatis supra basin 15 mm 2 costatis venulosis extus glabris intus basi ipse adpresso-pubescentibus cum glandulis negris; foliis petiolatis, petiolis 5–15 mm longis glabris; laminis coriaceis ovato-oblongis vel oblongo-ovalibus apice obtusis vel rotundatis basi obtusis rotundatis vel subacutis ad petiolum decurrentibus 15–27 cm longis 8.5–16 cm latis supremis minoribus supra glabris subtus in axillis nervorum tantum barbatis, nervis lateralibus utrinque prominentibus utroque latere 6–9 adscendentibus ante marginem exeuntibus, nervis tertiariis venulisque utrinque valde transverse reticulatis; inflorescentia terminali ampla repanda 20–25 cm longa 30 cm lata e basi trichotoma, ramis oppositis adscendentibus glabris inferioribus 6.5–9.5 cm longis superioribus 1–4 cm longis, cymis 7–12-floris; pedicellis 2–4 mm longis glabris; bracteis infimis oblongo-ovatis vel ovato-lanceolatis acutis vel subacutis 7–11 mm longis; bracteolis pedicellos subtendentibus ovatis acutis 3.5–4 mm longis; calyce 12 mm longo, hypanthio obconico 5 mm longo basi 3 mm lato, calycis tubo apice 8 mm lato 10-sulcato extus glabro intus dense barbato cum appendiculis glandularibus, calycis lobis subinaequalibus suborbicularibus rotundatis 2.5–3 mm longis 2–3.5 mm latis laxe reticulato-venulosis, lobo uno in laminam foliacam ovato-oblongam apice rotundatam 6.5–10 cm longam 3–5 cm latam glabram plerumque 5-palmatinerviam dilatato basin versus in unguem 2.5–5 cm longum 1.5–2 mm latum angustato; corolla 3–3.5 cm longa alba rosaceaque (teste Wurdack & Adderley) paullo zygomorphica extus glabro, tubo 2.1–2.4 cm longo supra 2.2–2.5 cm lato intus supra basin 4.5 mm dense barbato aliter glabro 20-sulcato, lobis in aestivatione contortis suborbicularibus rotundatis 11–15 mm longis 13–15 mm latis; staminibus subaequalibus prope basin tubi corollae insertis 19–20 mm longis attingentibus, filamentis liberis 9 mm longis glabris basi pubescentibus 2 mm longis in tubum basi corollae 4.5 mm coalitis;

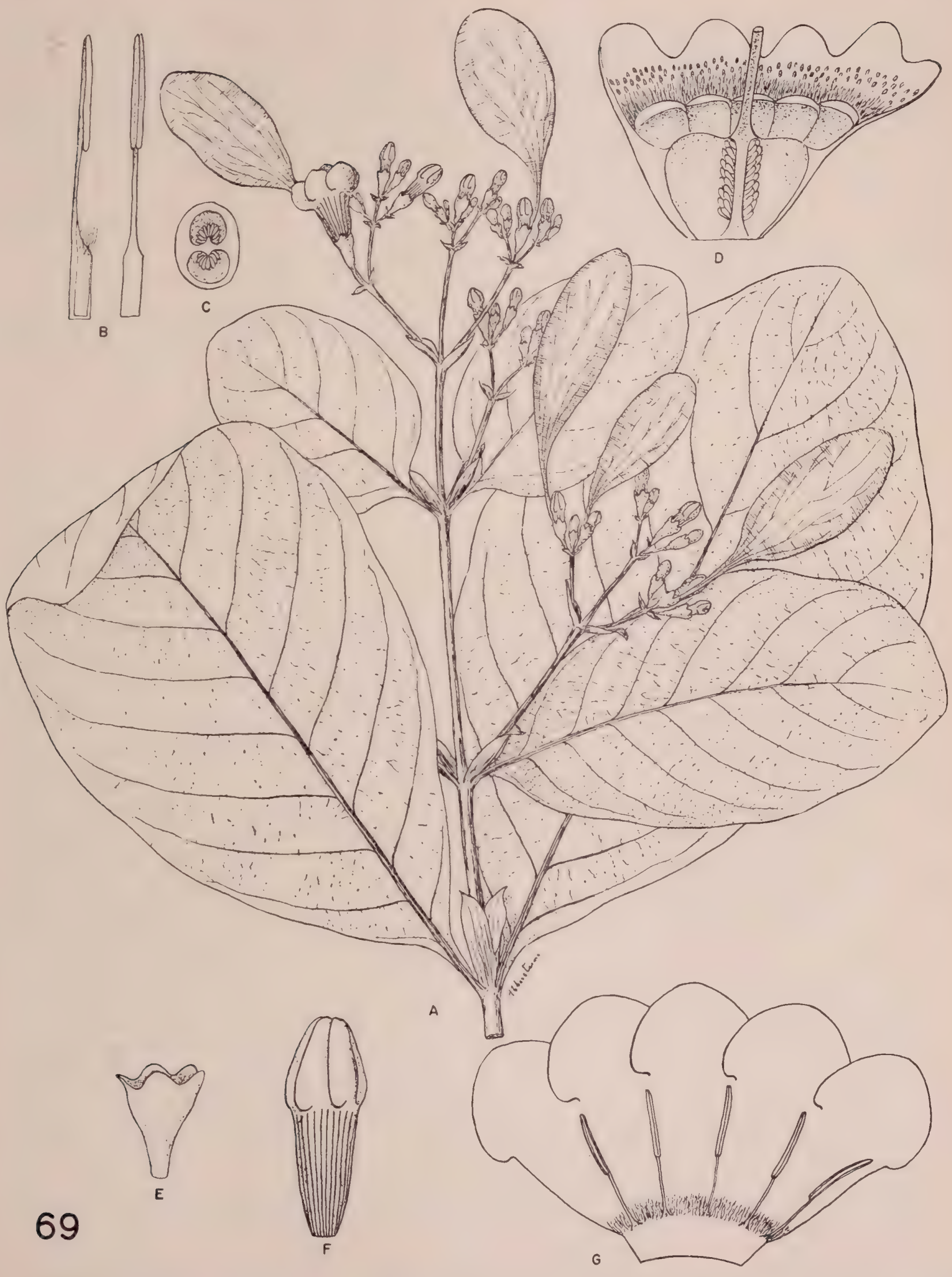


FIG. 69. *Capirona wurdackii.* A, habit, × ½. B, stamen in lateral and ventral views, × 2½. C, cross section, ovary, × 3. D, vertical section, ovary and calyx, × 3. E, calyx and hypanthium, × 1. F, corolla, in aestivation, × 1. G, corolla, opened, × 1.

antheris linearibus 6–8.5 mm longis 1 mm latis apice obtusis vel rotundatis; ovario obconico 5 mm longo, disco epigyno crasso 5-cupulari coronato 2 mm alto; stylo columnari 5–6 mm longo 0.7 mm lato glabro; capsula non visa.

VENEZUELA. Amazonas: near left bank of Caño Duquiapo, Río Casiquiare, 2 km above Solano; occasional; forest edge, laja; alt. 100 m; tree 8–10 m; corolla

white, the lobes pink; 10 Jul 1959, *J. J. Wurdack & L. S. Adderley 43383* (holotype NY, isotype VEN).

This species differs from *C. decorticans* Spruce, its nearest affinity, in the shorter and differently colored corolla, the more broadly infundibuliform limb of the corolla, the longer petaloid appendage of the calyx, the shorter style, the rounded instead of acute or abruptly acute calyx-lobes, and the somewhat shorter stipules.

Capirona decorticans Spruce, Jour. Linn. Soc. **3**: 200. 1859.

VENEZUELA. Amazonas: near Base Camp, Cerro Sipapo (Paráque); in forest along trail; alt. 125 m; tree 7 m high; 25 Jan 1949, *Maguire & Politi 28613* (NY).

The species has not been reported previously from Venezuela.

Chalepophyllum Hook. f. in Benth. & Hook. Gen. Pl. **2**: 50. 1873; Ic. Pl. *t. 1148*. 1873.

This genus was based upon *C. guyanense* Hook. f. in Hook. Ic. 12. pl. *1148*. 1873, collected by Schomburgk in "British Guiana." The flowers were described as being "solitarii, breviter pedicellati," with the lobes "late oblongi" and "obtusi," the capsule as "septicide 2-valvis." In Carolus Schumann's treatment in Martius's Flora Brasiliensis **6**(6): 246. 1889, the capsule is described as glabrous ("ut videtur glabra"). In the plate referred to, the leaves are shown as of an obovate type, the flowers are solitary on short pedicels, and the corolla-lobes are rounded at the summit and only half the length of the corolla-tube.

In the collections of this species made subsequently in British Guiana and adjacent Venezuela, it is evident that there is considerable variation in foliage and flower, even on the same plant. Leaf-blades are found to vary from oval-oblong to suborbicular and nearly as broad as long to oblong-obovate or obovate and up to 2 1/2 times as long as broad, the flowers may be solitary on short pedicels or two or three together borne on an elongated peduncle up to 5 cm long, and the corollas may be variable on the same plant, differing not only in relative length of tube but in the type of apex from rounded or obtuse to distinctly acuminate. Moreover, the capsules are appressed-pubescent with varying degrees of pubescence. Such variation is well brought out in the collections by *Maguire & Fanshawe 23169* from British Guiana and *Steyermark & Nilsson 348* from Venezuela, showing complete ranges of variation. In the latter collection some of the calyx-lobes are greatly elongated to 17 mm long and some of the capsules are as much as 18 mm long.

These polymorphic variations make it necessary to emend the original description as follows:

Chalepophyllum guianense Hook. f. var. **guianense**

Folia variabilia, laminis ovali-oblongis vel suborbicularibus vel oblongo-obovatis 2–9 cm longis 1.5–5.5 cm latis, in petiolum ad 10 mm longum angustata; floribus solitariis breviter pedicellatis vel inflorescentiis axillaribus ad 5 cm longe pedunculatis cum floribus 1–4; calycis tubo turbinato adpresso-canescenti, lobis subaequalibus vel valde inaequalibus ovatis vel lanceolatis vel oblongo-spatulatis obtusis vel acutis 2–17 mm longis 1–3.5 mm latis; corollis variabilibus, tubo 10–16 mm longo, lobis ovatis vel ovato-ovalibus obtusis vel acuminatis 8–12 mm longis;

stylis 5.5–13 mm longis; staminibus prope medium vel supra medium corollae insertis; capsulis 8–17 mm longis.

A variation with the leaf-blades all markedly narrowed to a cuneate base and of a narrowly obovate or spatulate-obovate shape, and 2½–3½ times as long as broad, is exemplified by *Maguire 33700* from savannas near Kavanayén, Venezuela. It is a distinct variety:

Chalepophyllum guianense Hook. f. var. **cuneatum** Steyermark, var. nov.

A var. *guianense* foliis plerumque spatulato-obovatis vel anguste obovatis basi in petiolum 3–5 mm longum prominenter cuneatis 2.5–7 cm longis 1.3–3.5 cm latis 2½–3½-plo longioribus quam latioribus recedit.

VENEZUELA. Bolívar: near Kavanayén; frequent in savanna; alt. 1300 m; shrub 5–15 dm high; flowers white; 30 Mar 1952, *Bassett Maguire 33700* (holotype NY).

Chalepophyllum longilobum Steyermark, sp. nov. Fig. 70, A–F.

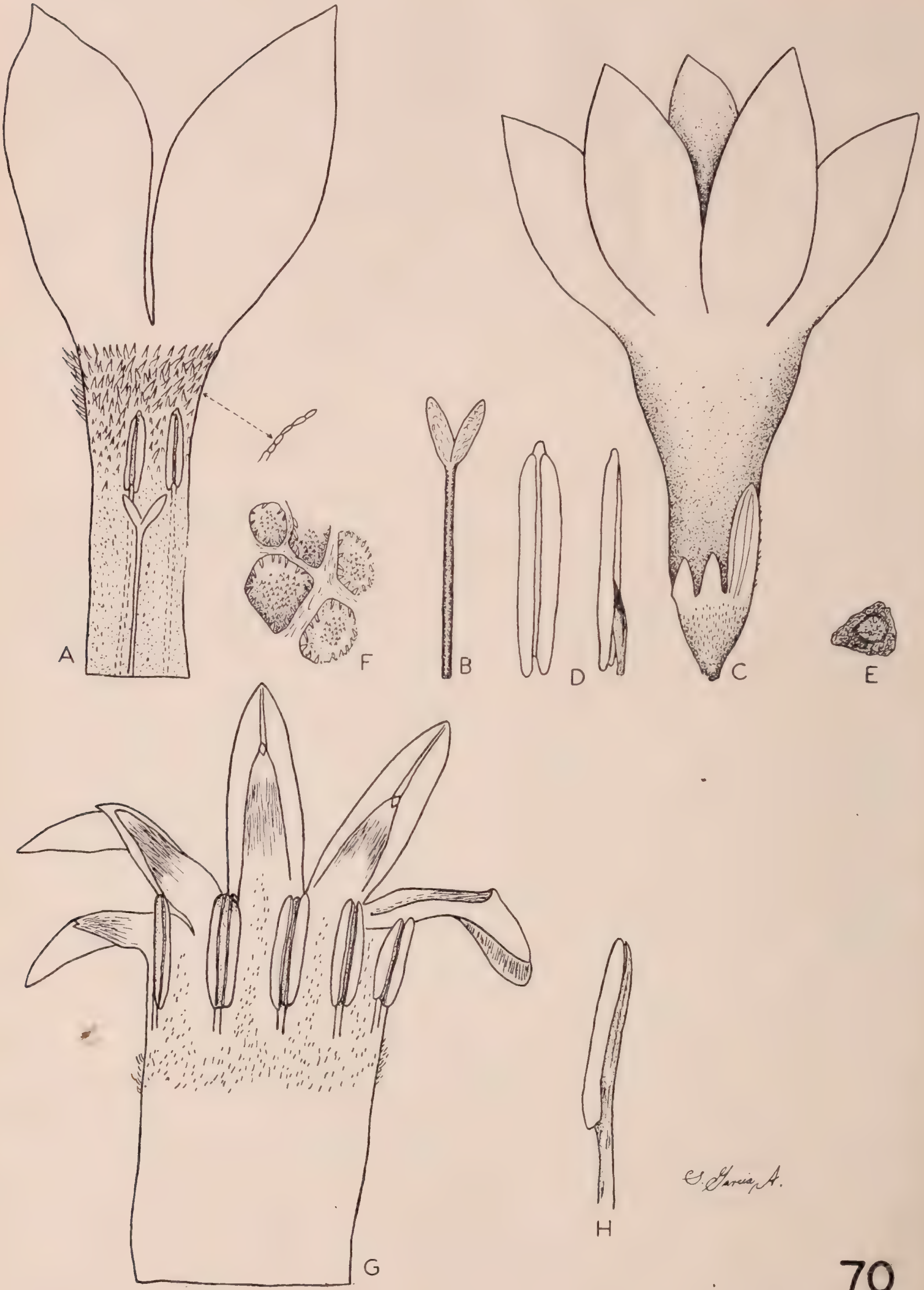
Frutex ad 4-metralis; foliis suborbiculari-obovatis vel suborbicularibus apice rotundatis basi rotundatis vel subobtusis subrevolutis 2.5–4.5 cm longis 1.5–4 cm latis subsessilibus in petiolum 1–2 mm longum contractis supra glabris nitidis subtus tessellato-ruguloso-areolatis pallido-tomentellis; floribus solitariis vel inflorescentiis ad 4.5 cm longe pedunculatis cum 3–4 floribus; calycis tubo turbinato 3 mm longo 2.5–3.2 mm lato, laciniis subaequalibus vel valde inaequalibus ovato-lanceolatis vel oblongo-lanceolatis acutis vel obtusis 2–6.5 mm longis 1–2 mm latis parce hirtello-ciliolatis; corolla elongata infundibuliformi variabili, tubo 13–14 mm longo basi 4.5 mm lato apice 8–9 mm lato intus fauce dense villosa pilis ad 2 mm longis basi papillato 3 mm aliter villosulo vel puberulo, lobis elliptico-oblongis acuminatis 14–15 mm longis 5.5–6 mm latis; antheris 3 mm longis; filamentis liberis 2 mm longis paullo supra medium corollae tubi insertis ad basin adnatis; stylis 6–13 mm longis glabris; stigmatibus lanceolato-oblongis obtusis 1.8–2 mm longis; capsulis 7–11 mm longis 5–7 mm latis; seminibus 2.8–3 mm longis 2.2 mm latis rugoso-alveolatis anguste alatis.

BRITISH GUIANA. Between Ayanganna and Chinowieng, Mt. Ayanganna, Pakaraima Mountains; occasional at forest edges; alt. 100–1200 m; shrub 4 m tall; flowers white; 7–8 Feb 1955, *Bassett Maguire, W. M. C. Bagshaw, & Celia K. Maguire 40637* (holotype NY).

This species is distinguished from *C. guianense* by the longer corolla-lobes which are as long as or longer than the corolla-tube. The seeds are 2.8–3 mm long, whereas in *C. guianense* they average 3–4 mm long with a broader wing. The depressions of the areolae on the lower surface of the leaves in *C. longilobum* have the papillae shorter and the ridges less hairy than in *C. guianense*, producing a more whitened, less tomentose appearance.

Key to the Species of *Chalepophyllum*

1. Corolla-lobes as long as or longer than the corolla-tube, 14–15 mm long. *C. longilobum.*
1. Corolla-lobes shorter than the corolla-tube, 6–12 mm long.
    2. All or nearly all leaves spatulate-obovate to obovate, distinctly narrowed to a cuneate base, 2½–3½ times as long as broad. *C. guianense* var. *cuneatum.*
    2. Leaves oval-oblong to suborbicular to oblong-obovate, rounded to narrowed at the base, nearly as broad as long to 2 or 2½ times as long as broad. *C. guianense* var. *guianense.*



70

FIG. 70. A–F, *Chalepophyllum longilobum.* A, portion of corolla dissected showing two corolla-lobes, two stamens and style with stigmas, × 3.5. B, style and stigmas, × 5. C, corolla and calyx, × 2.5. D, stamen in ventral and lateral views, × 10. E, seed, lateral view, × 6. F, portion of lower leaf surface, details, × 10. G–H, *Schradera yutajensis.* G, corolla spread open, × 5. H, stamen, lateral view, × 8.5.

Dendrosipanea Ducke, Arch. Inst. Biol. Veg. Rio de Janeiro **2**: 69. 1935.

This genus, a member of the tribe Rondeletieae, was established by Ducke in 1935 based on *D. spigelioides* Ducke collected from the state of Amazonas, Brazil (ad ripas inundatas fluminis Curicuriary affluentis Rio Negro superioris). When he described this genus, Ducke believed that its closest allies were *Ucriana* and *Sipanea,* both of which genera have loculicidally dehiscent capsules. In his original description of the genus Ducke (loc. cit. pp. 69–70) states that the capsule "ab apice loculicide dehiscens," but an examination of mature fruiting capsules of an isotype specimen at NY (*Ducke 24426*) shows indubitably that the dehiscence is septicidal.

The septicidal type of dehiscence is further demonstrated by the collection of *Maguire, Wurdack, & Bunting 37592,* the holotype of one of the new species of this genus described below. The small, angled, many-sided scrobiculate seeds of the *Maguire, Wurdack, & Bunting* collection are obviously of the same type as and congeneric with those of *D. spigelioides.*

The relationship of *Dendrosipanea,* because of its septicidal type of dehiscence, is much closer to the genus *Chalepophyllum,* discussed in another section of this paper, than with any other genus. The main differences between the two genera are to be found in the type of inflorescence, character of seeds, ornamentation of the lower surface of the leafblades, stipules, and amount of viscous exudation of the upper nodes of the branches. These differences may be expressed in the following key:

1. Seeds narrowly winged or margined, compressed, the testa spongy-foveolate, 2.8–4 mm long, the body contour evident by the constricted margins; stipule inconspicuous, low, broadly triangular, barely acute, not bifid; inflorescence axillary, of solitary flowers or cymosely grouped 2–4 together at the ends of short or elongated peduncles; veins on lower surface of leaf-blades prominently elevated to form a tessellated rugulose areolate surface; glutinous exudate abundant and obvious in uppermost parts of the branches at the base of the petioles, pedicels, or peduncles. *Chalepophyllum.*

1. Seeds neither alate nor margined, angled, many-faced, not compressed, the testa finely scrobiculate, 1–1.8 mm long, the body contour not evident; stipules conspicuous, becoming acuminate and often bifid; inflorescence terminal in a many-flowered usually trichotomous cincinnate cyme; lower surface of leaf-blade not tessellate-areolate, the veins not elevated; glutinous exudate of branches lacking or inconspicuous. *Dendrosipanea.*

The new collections of *Dendrosipanea* by Maguire and Wurdack and their associates, especially those assigned to the new species, *D. revoluta,* demonstrate the close affinities between *Dendrosipanea* and *Chalepophyllum,* but the two genera may be distinguished on the basis of the differences outlined above.

In view of the erroneous original description of the mode of dehiscence of the fruit by Ducke, it is necessary to emend the description as follows:

Dendrosipanea Ducke emendavit Steyermark

Capsula ab apice septicidali dehiscens.

Shrubs or small trees. Stipules interpetiolar, entire to bifid with a pronounced acute to acuminate apex, mainly persistent. Leaves opposite, petiolate. Inflorescence many-flowered, terminal, trichotomously branched into a cincinnate cyme. Bracts of inflorescence inconspicuous, subtending short pedicels. Calyx-lobes 5, persistent, equal or unequal. Calyx-tube (hypanthium) turbinate. Corolla white, hypocrateriform, the tube elongated-cylindrical, densely yellow-barbate in throat, villosulous within to above a glabrous or papillate basal portion. Corolla-lobes 5, contorted, shorter than the tube. Stamens 5, included, inserted about half-way up corolla-tube. Anthers dorsifixed, linear-oblong, apiculate, subsagittate at base. Free portion of filaments short, the vascular tissue extending prominently as a ridge to base of corolla-tube. Style equaling or much shorter than corolla-tube, glabrous; annular disk at base of style short; stigmas oblong-ovate or oblong, glabrous. Capsule septicidally dehiscing from the apex, slightly ligneous. Seeds numerous, minute, irregularly many-sided, angled, finely scrobiculate, 1–2 mm long.

Type species: *Dendrosipanea spigelioides* Ducke.

Key to the Species of *Dendrosipanea*

1. Corolla-tube 9–12 mm long; corolla-lobes 8–9.5 mm long; leaf-blades mostly rounded or broadly obtuse at apex, oblong- to oblanceolate-spatulate, mainly broadest above the middle; leaf-blades generally revolute-margined, the lateral nerves and midrib of upper surface markedly sulcate. 1. *D. revoluta.*

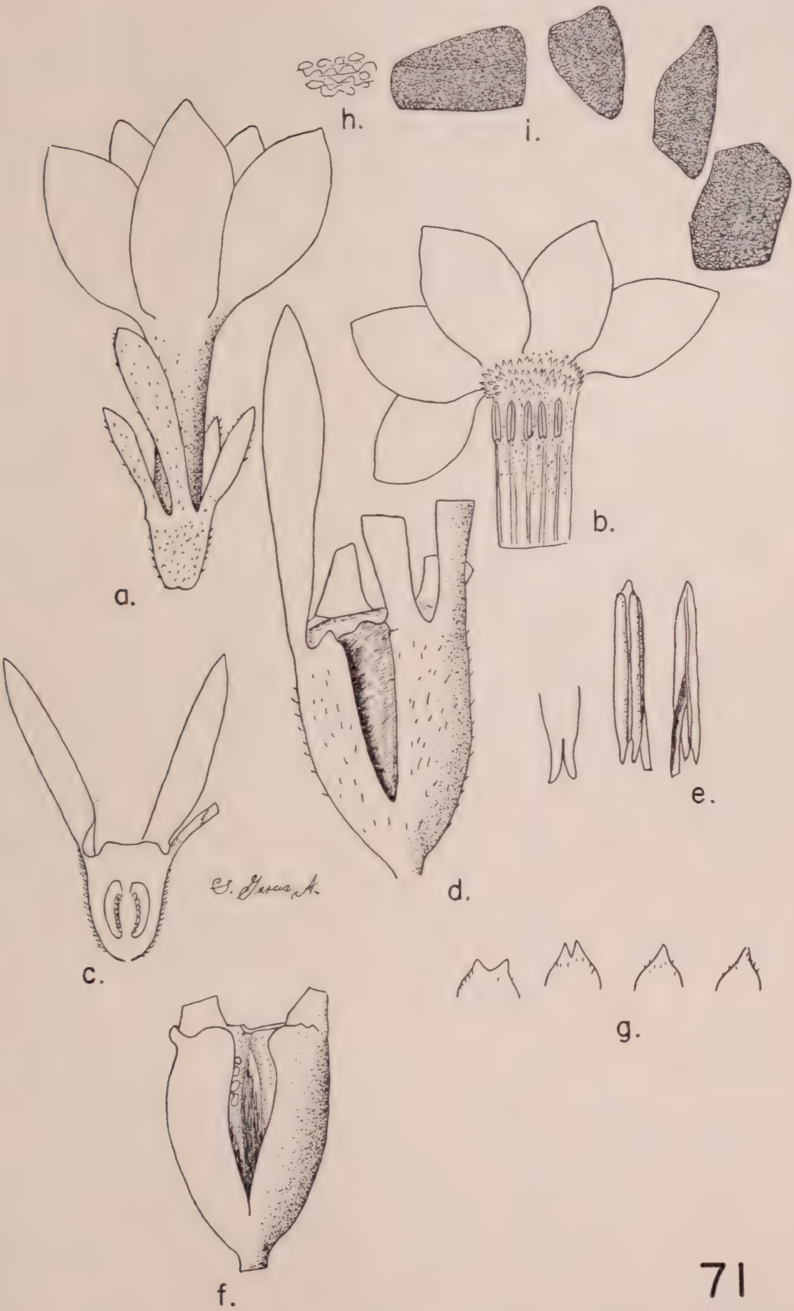
1. Corolla-tube 15–20 mm long; corolla-lobes 13–16 mm long; leaf-blades acute to acuminate, elliptic-lanceolate, oblong-lanceolate, or lance-ovate, broadest at the middle; leaf-blades plane, scarcely or not at all revolute-margined, the lateral nerves and midrib of upper surface not sulcate.

    2. Calyx-lobes linear-lanceolate, oblanceolate, or spatulate-oblong, equaling to 5 times exceeding length of hypanthium, 2–9 mm long, mostly unequal in length; pedicels, rachis of inflorescence, outer surface of hypanthium, calyx-lobes, and corolla-tube strigillose; branches, outer surface of stipules, and lower surface of leaf-blades hirtellous. 2. *D. wurdackii.*

    2. Calyx-lobes triangular-lanceolate, less than or at most equaling length of hypanthium, 1.5–2 mm long, mostly equal; pedicels, rachis of inflorescence, outer surface of hypanthium, calyx-lobes, and corolla-tube glabrous or subglabrate; branches, stipules, and lower surface of leaf-blades glabrous or glabrate. 3. *D. spigelioides.*

1. Dendrosipanea revoluta Steyermark, sp. nov. Fig. 71.

Frutex 0.5–2 m, ramulis manifeste hirtellis; nodis superioribus paullo viscosis; stipulis triangulari-ovatis acuminatis vel medio bifidis 2–4 mm longis extus irregulariter strigillosis hispidulo-ciliolatis; foliis petiolatis, petiolis 2–6 mm longis anguste marginatis supra glabris vel paullo hispidulis subtus manifeste hirtellis, laminis subcoriaceis subtus pallidioribus valde revolutis anguste oblongo- vel oblanceolato-spatulatis basi valde cuneatim angustatis apice plerumque rotundatis vel late obtusis 3–9.5 cm longis 1–3.5 cm latis supra glabris vel paullo asperulo-hirtellis subtus parce vel sat dense pilosulis supra costa media nervis lateralibusque manifeste sulcatis subtus elevatis, nervis lateralibus utroque latere 7–9; inflorescentia terminali vel axillas supremas terminanti basi demum in cincinnos confertos desinenti composita trichotoma 1.5–4.5 cm longa 2.5–7 cm lata, bracteis lanceolatis vel triangulari-ovatis acutis vel acuminatis 1.5–2.5 mm longis, eis basi lineari-lanceolatis ad 5 mm longis parce vel densius hirtellis hispidulo-ciliolatis; pedicellis 1–4 mm longis plus minusve dense hispidulis; calycis lobis 5 subaequalibus vel inaequalibus lineari-lanceolatis, oblanceolatis vel spatulato-oblongis apice acutis obtusis vel rotundatis 2–9 mm longis 0.7–3.5 mm latis extus parce vel moderatim hispidulis intus glabris vel in parte inferiore hispidulis marginibus hispidulo-ciliolatis; calycis tubo (hypanthio) subturbinato 2–3 mm longo apice 1.5–2.8 mm lato; corolla alba hypocrateriformi, tubo 9–12 mm longo basi ca. 2 mm lato supra 3–4 mm lato extus parce vel plerumque moderatim strigilloso vel hirtello intus in parte basilari 2–3 mm glabra vel papillosa excepta aliter



71

FIG. 71. *Dendrosipanea revoluta.* a, corolla and calyx, × 3. b, corolla, spread open, showing all but lowest portion of corolla-tube, × 2.5. c, vertical section, ovary and calyx, × 5. d, capsule, splitting septicidally, with attached calyx lobes, × 4.5. e, stamen in ventral and dorsal views, × 10. f, capsule, splitting septicidally, with portion of attached calyx-lobes, × 4.5. g, variations of stipules, × 2. h, surface ornamentation of testa of seed, highly magnified. l, seed, viewed from various positions, × 11.5.

villosulo, fauce dense et sat longe sulphureo-villosula, lobis ovatis subobtusis vel subacutis 8–9.5 mm longis 4.5–6 mm latis extus parce strigillosis vel subglabris marginibus basi ciliolatis exceptis intus glabris; antheris lineari-oblongis apiculatis basi breviter subsagittatis 2.2–3 mm longis 0.4–0.5 mm latis; stylo breviore quam tubo vel aequilongo 2.3–12 mm longo glabro; stigmatibus 0.8–1.5 mm longis; capsulis oblongo-turbinatis ab apice septicidaliter dehiscentibus 7–8 mm longis 4–5 mm latis strigillosis vel subhirtellis; seminibus fulvis irregulariter polyedricis 1.25–1.8 mm longis 0.7–1 mm latis non alatis minute scrobiculatis.

VENEZUELA. Amazonas: right bank of Río Pacimoni, 50 km above mouth; frequent in savanna; alt. 100–140 m; shrub 1–2 m; flowers white; 7 Feb 1954, *Maguire, Wurdack, & Bunting 37592* (holotype NY); right bank of Río Pacimoni, 60 km above mouth; frequent in savanna; alt. 100–140 m; shrub to 3 m; flowers white; 29 Nov 1953, *Maguire, Wurdack, & Bunting 36672* (paratype NY); Sabana Pacimoni on right bank of Río Pacimoni, 50 km above mouth; locally abundant; alt. 100 m; shrub 0.5–2 m; flowers white; 2 Oct 1957, *Maguire, Wurdack, Keith, & Maguire 41665* (paratype NY); Sabana Manacal, Río Atabapo, 15 km above Guarinumo; alt. 125 m; shrub 0.7–1 m; flowers white; 12 June 1959, *Wurdack & Adderley 42972* (paratype NY).

This species is variable primarily in the amount of its pubescence on the outer surface of the hypanthium, calyx-lobes, and corolla-tube, and, secondarily, in the shape and size of the calyx-lobes, in the length of the style and in acuteness of the corolla-lobes. In most of the material examined, the leaf-blades are quite revolute and the pubescence is dense and more or less abundant on the lower surface of the leaf-blades, and outer surface of hypanthium, calyx-lobes, and corolla-tube. In the collection of *Wurdack & Adderley 42972*, however, the hairs are scant or nearly lacking on the lower surface of the blades and outer surface of hypanthium, calyx-lobes, and corolla-tube, and the leaf-blades are less or not at all revolute.

In anthesis, the calyx-lobes may be relatively short, 3–4.5 mm, and linear-lanceolate to lanceolate, or may be more elongated, especially in post-anthesis and fruit, from 7–10 mm long and oblanceolate to narrowly spatulate-oblong, and varying from acute to obtuse or rounded. In *Wurdack & Adderley 42972* the calyx-lobes are more triangular-lanceolate and acute and relatively short. In this collection, likewise, the corolla-lobes are more pointed than in most of the other material examined in this species.

The style varies from 2.3–6 mm long, included in the lower portion of the corolla-tube or may equal the length of the corolla-tube. Likewise, the stipule is quite variable, varying on the same branch from an acuminate apex which is entire to a bifid type in which the portions may be close together or widely separated with a shallow groove. Frequently the type with a widely separated bifid apex with a shallow groove is encountered on the uppermost part of the stem below the inflorescence, while those stipules lower down on the branch may be more deeply bifid with a narrower separation or may have a prolonged acuminate uncleft apex.

The inflorescence of *D. revoluta* is much more contracted and shorter, as well as narrower, than that of *D. spigelioides*, and presents a more crowded and aggregate type.

2. **Dendrosipanea wurdackii** Steyermark, sp. nov. Fig. 72, A–G.

Frutex 2–4-metralis, ramulis strigillosis; stipulis triangulari-ovatis acutis vel acuminatis vel medio bifidis 2.5–3 mm longis extus parce strigillosis; foliis

petiolatis, petiolis 5–10 mm longis supra glabris vel subglabris subtus strigillosis, laminis subcoriaceis subtus pallidioribus anguste elliptico-lanceolatis basi cuneatim angustatis acutisque vel supremis subobtusis apice acutis vel subacutis 4.5–11 cm longis 1.5–3 cm latis supra glabris subtus costa media nervis lateralibus venulisque parce strigillosis aliter glabris, nervis lateralibus utroque latere 9–11 arcuato-adscendentibus ante marginem anastomosantibus venulis supra nullis subtus tenuissime prominulis; inflorescentia terminali 4.5–5.5 cm longa basi trichotoma, bracteis lanceolatis acutis vel acuminatis 1.5–2 mm longis extus strigillosis pedicellatis; pedicellis 3–4 mm longis hispidulo-strigillosis; calycis lobis 5 subaequalibus lanceolatis vel elliptico-lanceolatis acuminatis vel acutis 3–3.5 mm longis 0.8–1 mm latis extus strigillosis hispidulo-ciliolatis intus glabris; calycis tubo (hypanthio) subcampanulato 1.5 mm longo apice 3 mm lato extus strigilloso; corolla alba hypocrateriformi, tubo 16–20 mm longo basi 2.3–2.5 mm lato supra 3.5 mm lato extus parce strigilloso intus in parte basilari 8 mm longa glabra excepta aliter villosulo, fauce dense et sat longe sulphureo-villosula, lobis lanceolato-oblongis apice subfalcato-acutis 15–16 mm longis 5–5.5 mm latis glabris; antheris lineari-oblongis apiculatis basi breviter subsagittatis 2.8 mm longis 0.3 mm latis; stylo 3–3.5 mm longo glabro; stigmatibus elliptico-lanceolatis 2–2.5 mm longis; capsula non visa.

VENEZUELA. Amazonas: Sabana El Venado on left bank of Caño Pimichín above Pimichín, Río Guainia; occasional; alt. 140 m; shrub 2–4 m; flowers white, fragrant; 14 Apr 1953, *Maguire & Wurdack 35558* (holotype NY).

This species differs from *D. spigelioides* Ducke of the Curicuriary branch of the upper Río Negro in the strigillose pubescence which covers the outer surface of the corolla-tube, calyx-lobes, hypanthium, lower portion of leaf-blades, and branches, in the much shorter styles not reaching the height of the anthers, and in the much longer calyx-lobes. From the material available for examination it would appear that the inflorescence of this species, like that of *D. revoluta,* is more contracted and shorter, as well as narrower, than that of *D. spigelioides,* and has a more crowded denser aspect.

3. **Dendrosipanea spigelioides** Ducke, Arch. Inst. Biol. Veg. Rio de Janeiro **2**: 70. 1935.

Distribution. State of Amazonas, Brazil. Known only from the region of the Rio Curicuriary.

BRAZIL. Amazonas: Rio Curicuriary affluentis Rio Negro superioris; ad ripas inundatas; 19 Oct 1932, *A. Ducke 24426* (isotype NY).

The isotype specimen at NY shows minor variations from the description of the species. According to the material examined, this species has a larger, more laxly branched inflorescence than either of the other two species of the genus.

Henriquezia Spruce, ex Benth. in Hook. Kew Jour. **6**: 338. 1854.

This genus has an interesting disrupted distribution, one species, *H. jenmani* K. Schum. known from the Mazaruni River of British Guiana, all the remaining species being known from the Río Negro, Río Guainia, and portions of the Upper Río Orinoco, and various tributaries of these rivers (Rio Curicuriary and Rio Içana in Brazil, Río Vaupes in Colombia, and Río Atabápo, Río Temí, and Río Pacimoni in Venezuela). In the intervening large region no collections of the genus are known.

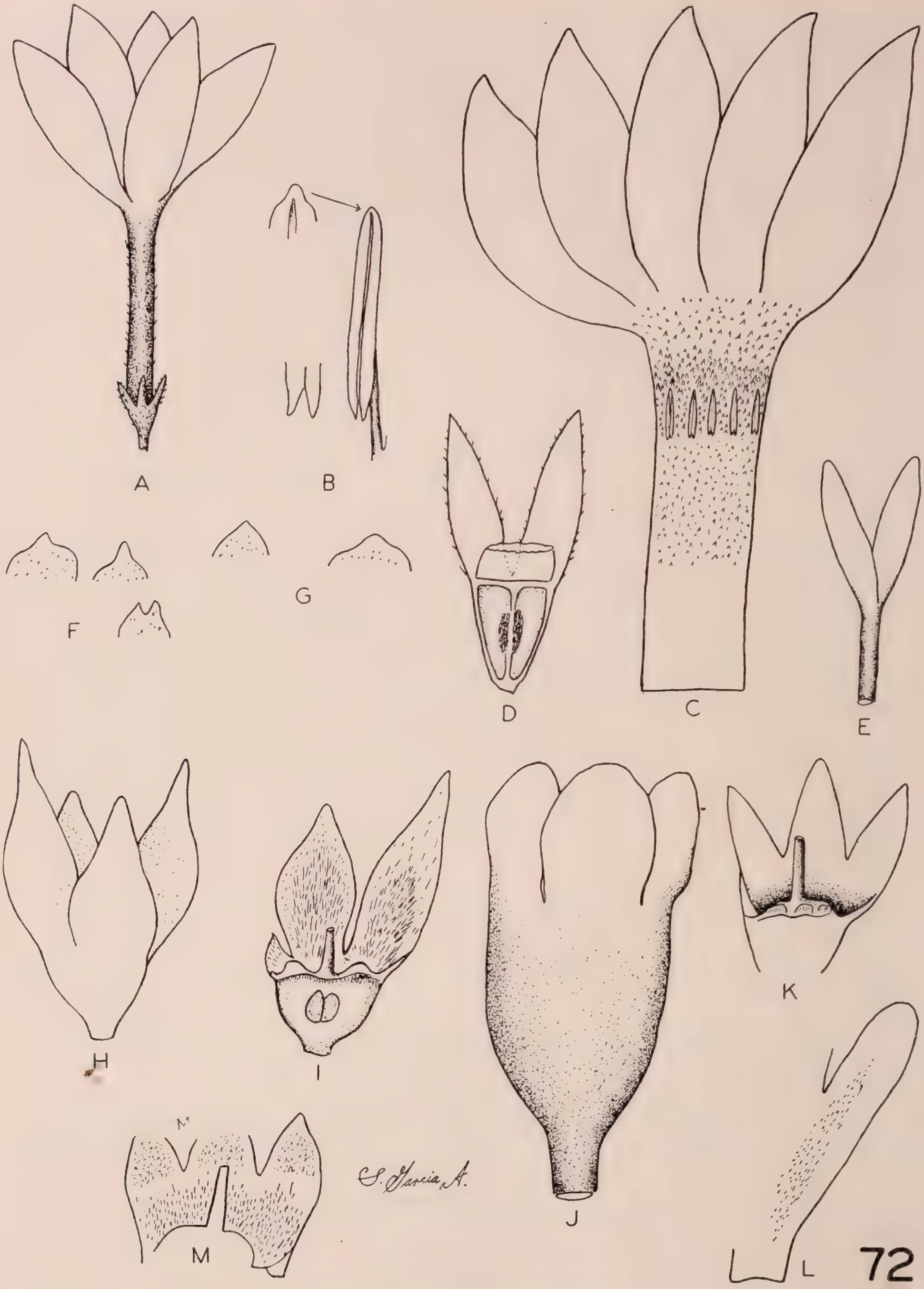


FIG. 72. A–G, *Dendrosipanea wurdackii.* A, corolla and calyx, × 1.5. B, stamen, lateral view, with apex and base of anther shown, × 10. C, corolla spread open, × 2.5. D, vertical section, ovary and calyx, × 7.5. E, stigmas and upper half of style, × 8.5. F, stipules from various portions of branches, × 2. G, stipules at forks and nodes of branches, × 2. H–J, *Henriquezia nitida* var. *nitida.* H, calyx and hypanthium, × 2. I, vertical section through ovary and hypanthium, × 2. J, corolla, × 1. K–M, *Henriquezia verticillata* var. *verticillata.*

This geographical hiatus is interesting in that the British Guiana species differs in various respects from all the other species of the genus, while the species from Brazil and southwestern Venezuela are a closely knit group with detailed relationships. The species from British Guiana is the only one of the genus in which all the corolla-lobes show pubescence on their inner surface, whereas in all the other species only one of the corolla-lobes is pubescent within. In the species from British Guiana the calyx-lobes are not cut down all the way, thus leaving a partial tube or hypanthium, whereas in all the other species, the calyx-lobes are deeply cut to the base with overlapping or imbricating margins; they are also more foliaceous and conspicuous than in *H. jenmani.* Finally, it should be noted that in *H. jenmani* the inner surface of the stipules has loose fairly evident ascending hairs, whereas in the other species the pubescence consists of a tomentum of very short and minute puberulence. These differences may be expressed in the following key to the species.

Key to Species of *Henriquezia*

1. Lower surface of leaves gray-whitish with dense minute papillate excrescences; inner surface of stipules hirtellous with obvious loose ascending hairs; inner surface of all the corolla-lobes villosulous or puberulous; British Guiana. 1. *H. jenmani.*

1. Lower surface of leaves pale green or green, glabrous but not showing dense papillate excrescences; inner surface of stipules appressed-tomentulose or sericeous, the hairs not obvious; inner surface of only one corolla-lobe villosulous or bearded; southwestern Venezuela, eastern Colombia, and northwestern Brazil.
  2. Calyx-lobes 25–30 mm long, nearly as long as the corolla-tube. 4. *H. longisepala.*
  2. Calyx-lobes 4–18 mm long, 1/4–5/8 as long as the corolla-tube.
    3. Calyx-lobes relatively short, 4–8 mm long, acute or subacute, without overlapping, imbricate margins, not completely parted to the summit of the ovary, a distance of 3.5–4.5 mm separating top of ovary from base of calyx-lobe; stipules usually absent during or after anthesis; inflorescence usually longer than broad, the 2–4 secondary lateral axes short and ending in the pedicels; lateral nerves sulcate above. 2. *H. verticillata.*
    3. Calyx-lobes foliaceous, relatively elongated, 10–18 mm long, generally acuminate to caudate, some of the lobes with a prolonged apex, some of them with partly overlapping, imbricate margins, the lobes parted all the way down to the summit of the ovary; stipules persistent during and after anthesis; inflorescence usually broader than high or as broad as high, dichotomously cymose, the 2–3 secondary axes elongating into tertiary axes before ending in the pedicels; lateral nerves impressed or prominulous above. 3. *H. nitida* and varieties.

1. **Henriquezia jenmani** Schum. in Mart. Fl. Bras. **6**^{6}:135. 1889.

Distribution. British Guiana, along the Mazaruni river and at its junction with the Essequibo River.

BRITISH GUIANA. Mazaruni River; tree from 10 to 40 or more feet high; Sep 1880, *G. S. Jenman 629* (holotype K, photo NY); Bartico Point, Essequibo and Mazaruni River junction; foreshore on sandy silt at or below tide level; 13 Sep 1942, *Forest Dept. Field No. F 847* (Record No. 3583) (F, NY).

Reported by N. E. Brown (Trans. Linn. Soc. II **6**: 33. *pl. 4.* 1901) on collection of *Mc Connell & Quelch 711* from Mazaruni River, British Guiana ("This hand-

---

K, showing adnation of calyx to summit of ovary with relative distance between lobes and summit of ovary, × 2. L, showing bearding of fifth corolla-lobe and contiguous portion of corolla-tube, × 1. M, showing sericeous zone within of hypanthium and lower part of calyx-lobes, × 2.

some tree appears only to have been collected in this single locality''). Plate 33 shows the five corolla-lobes pubescent within. On a single large detached leaf-blade, the apex is drawn as broadly rounded and mucronulate, while the whorls of leaf-blades at and just below the inflorescence are shown as definitely acute or acuminate.

Henriquezia jenmani is known thus far only from British Guiana and represents an isolated eastern outlier of a genus whose distribution otherwise is confined to the drainage of the Upper Río Negro, Guainia, and Upper Orinoco of southwestern Venezuela, adjacent Colombia, and state of Amazonas in northwestern Brazil. This species is unique in the genus in having 1) all the corolla lobes, instead of one of them only, with pubescence on the inner surface, 2) glaucous lower surface of the leaf-blade with a minute dense papillate surface, and 3) a loose, ascending hirtellous pubescence on the inner surface of the stipules as contrasted with the minutely tomentose or sericeous-velutinous short tomentum of the other species.

In the original description the leaves are stated to be ternate. The herbarium specimens of *Forest Dept. F 847* show leaves varying from ternate to quaternate. Although the length of the stipules is given as 1.7–2 cm long in the original description, the specimens of *Forest Dept. F 847* have stipules only 0.9–1 cm long. The petioles in the original description are stated to be 2–2.5 cm long, whereas measurements of *Forest Dept. F 847* specimens show petioles varying from 1–1.7 cm long; moreover, the photograph of the holotype shows petioles not exceeding 1.7 cm in length. Probably the most serious divergence is in Schumann's description of the lower surface of the leaf-blades as ''subtus opacis tomento minutissimo canescentibus reticulatis'' (loc. cit. p. 135). Actually, the specimens examined of *Forest Dept. F 847* have the lower surface of the leaf-blades gray-white or ''glaucous,'' but they are glabrous and without any tomentum; instead, their surface has a dense white papillate covering over a reticulate venation. It is not glaucous, since it has no ''bloom'' which can be rubbed off. It is believed that Schumann's description must be re-interpreted to mean a densely gray-white papillate surface produced over a reticulate venation.

Furthermore, in the original description the corolla is stated to be 50 mm long, whereas present measurements of the *Forest Dept. F 847* specimens show the corolla length as 35–41 mm. However, it has been found that corolla measurements in the other species of *Henriquezia* are subject to considerable variation, depending on conditions of pressure and shrinkage after drying.

The lateral branches of the inflorescence shown in the photograph of the holotype specimen at NY attain 5 cm in length, whereas on the *Forest Dept. F 847* specimens they are only 1.5–2.5 cm long. Despite the above discrepancies, however, there appears to be no doubt of the conspecific identity of the *Forest Dept. F 847* specimens with the holotype of *Jenman 629*.

2. **Henriquezia verticillata** Spruce ex Benth. in Hook. Kew Jour. Bot. **6**: 338. 1854.

Henriquezia obovata Spruce ex Benth. Trans. Linn. Soc. **22**: 297. 1859.

Henriquezia obovata Spruce, described from a single fruiting specimen by Spruce along Upper Río Negro (Guainia) above confluence of Casiquiare, appears to be identical with *H. verticillata* collected by Spruce in flower from Brazil along Rio Negro above Barraroa to San Gabriel do Cachoeiras. The base of the leaf-blade is rounded in *H. obovata,* cuneately narrowed in *H. verticillata,* 4-

verticillate in *H. obovata* and mainly 5-verticillate in *H. verticillata,* but there is variability in leaf-base in *H. verticillata,* and the base of the leaf-blade cannot be used to separate the two, nor can 4- or 5-verticillate arrangement. Also, leaf-shape and length and width are quite variable. The photo of the type of *H. obovata* shows the prominently elevated lateral nerves of the lower side of the leaf-blade, which likewise are characteristic of the leaves of *H. verticillata.*

Two variations may be recognized:

Main leaf-blades rounded, truncate, or retuse at apex. 2a. *H. verticillata* var. *verticillata.*
Main leaf-blades abruptly acute to subacuminate, or rarely obtusely acute at apex.
2b. *H. verticillata* var. *apiculata.*

2a. Henriquezia verticillata Spruce ex Benth. var. **verticillata** Fig. 72, K–M.

Henriquezia verticillata Spruce ex Benth. in Hook. Kew Jour. Bot. **6**: 338. 1854.
Henriquezia obovata Spruce ex Benth. Trans. Linn. Soc. **22**: 297. 1859.

Distribution. Rio Negro, state of Amazonas, Brazil, and Río Guainia and Territorio Federal Amazonas, Venezuela.

VENEZUELA. Amazonas: along the Guainia, above the confluence of the Casiquiare; tree 40–60 ft. high; leaves constantly 4 together; June, 1854, *Spruce s. n.* (photo NY); along Río Guainia near Maroa; occasional; large riverine tree; leaves (4-)5-whorled; corolla white, each lobe with central pink line, the throat and tube within orange-speckled, one lobe with yellow markings; alt. 120–140 m, 27 Nov 1953, *B. Maguire, J. Wurdack, & G. Bunting 36432* (NY). BRAZIL. Edo. Amazonas: secus Rio Negro, inter Barcellos et San Isabel (Rio Negro, gapo, frequent from above Barraroa to Sao Gabriel); tree 80–100 ft by 4 ft; flowers odoriferous, pink without, white within with a streak of yellow pubescence in front; Dec 1851, *Spruce 1957* (photo NY, isotype NY); Cucui, Rio Negro; árvore, 25 metros, 50 cm; belo ornamento, flores em profusão; 14 Dec 1945, *Froes 21518* (NY, US); Rio Negro, Preto, Maboaby; border of river near to caatinga; tree 40 ft; high land, high forest; flowers rosy, white red strip; 17 Nov 1947, *Froes 22872* (NY, US); same locality, 8 Nov 1947, *Froes 22784* (NY); Manaos, ad ripas paludosas rivuli, Mindú superioris; arbor magna; flores albi, tubo intus striis purpureis et linea lutea pilosa ornato; 22 Oct 1929, *Ducke 22813* (NY, US); Manaos, igapó do Igarapé Mindú no curso superior; arvore grande; corola branca comdesenhos roseos e, do lado interior con sinal amarelo; 12 Nov 1942, *Ducke 81* (US).

The leaves in the type description are stated to be ''obtusiuscula v. breviter et acuta acuminata'' at the apex, and ''cuneato-acuta'' at the base; they vary on the same specimen from broadly rounded at the apex with a minute mucro to, especially the uppermost ones subtending the lowest inflorescence branches, cuspidate or abruptly acute to acuminate, and at the base from cuneately narrowed to subcordate. This is shown by specimens of *Froes 21518* and *Froes 22784* (NY), in which some leaves are cuneate, others rounded at base. Duplicate specimens of these same numbers seen by Bremekamp apparently had all the leaves rounded at base, causing him to err in believing that these numbers differed from typical *H. verticillata* in cuneate versus rounded leaf-bases. He also misjudged in believing that these numbers, together with *Ducke 81* and *22813,* had the leaves with a smaller number of pairs of nerves (7–9 instead of 11). Although Bentham does not account for the number of lateral pairs of nerves in his original description of *H. verticillata,* actually an examination of the isotype specimen of *H. verticillata* (*Spruce 1957*) at NY shows 9–10 pairs of nerves, while a photo of the holotype of this number at K at NY shows leaves with 10 pairs. The NY specimen of *Froes 22784* does not have the 7–9 pairs of lateral nerves stated as such to be the case by Bremekamp, but has 7–10 pairs, while the *Froes 21518* sheet at NY shows leaves also having 7–10 pairs. Therefore, variation extends to 10 pairs on the sheets at NY of the same numbers seen by Bremekamp and stated by him (loc. cit. p. 376) as having 7–9 pairs.

The leaves in *H. verticillata* are often 5-verticillate, but may be 4-verticillate, and in the collection of *Maguire, Wurdack, & Bunting 36432* they are both 4- or 5-verticillate.

2b. **Henriquezia verticillata** var. **apiculata** Steyermark, var. nov.

A var. *verticillata* recedit laminis apice subito acutis vel subacuminatis vel obtuse acutis 10–23 cm longis 5–8 cm latis, nervis lateralibus utroque latere plerumque (9–)12–13; stipulis in anthesi juvenili manifestis linearibus ad 40 mm longis 1–2 mm latis dense castaneo-tomentellis; inflorescentiae bracteis in anthesi juvenili manifestis, eis ramulos primarios amplectentibus ovatis vel lineari-lanceolatis apice acuminatis vel lineari-lanceolatis apice acuminatis vel subulatis vel supremis saepe trifurcatis 8–15 mm longis 2–5 mm latis ferrugineo-tomentellosis, eis pedicellos amplectentibus ovato-lanceolatis vel ovatis acuminatis integris vel bi- vel tri-furcatis 9–10 mm longis 3–5 mm latis.

BRAZIL. Edo. Amazonas: Manaos, in silva igapó secus Igarapé Mindú superiorem; arbor magna; corolla alba roseopicta, intus flavosignata; 19 Dec 1935, *A. Ducke 81* (holotype US, isotype NY).

This variety is distinguished from var. *verticillata* by the abruptly acute to subacuminate instead of rounded, retuse, or truncate tips of the leaf-blades. A collection of *Ducke 21683* in US (Manaos, silva paludo secus rivulas, 8 Dec 1927) is somewhat intermediate with leaf-tips only obtusely acute to acutish.

In the holotype and isotype specimens the stipules at the base of the upper leaf-verticils and the bracts of the inflorescence are present and conspicous, whereas in all the collections thus far examined of var. *verticillata*, the stipules and inflorescence bracts are caducous and absent. It is probable that both the stipules and inflorescence bracts are quickly shed as the inflorescence develops into anthesis. In the type collection the very early anthesis shown would explain the still-persistent state of the stipules and bracts. In the intermediate collection of *Ducke 21683*, all the bracts and all but the uppermost stipules have fallen from the specimen shown in a later stage of anthesis than in the type collection of var. *apiculata*.

It should be noted that the holotype of var. *apiculata* (*Ducke 81*, 19 Dec 1935) is a different collection from that labelled var. *verticillata* (*Ducke 81*, 12 Nov 1942) and deposited in US.

3. **Henriquezia nitida** Spruce ex Benth. Trans. Linn. Soc. **22**: 297. 1859.

This species, based upon a flowering collection of Spruce (no. *3690*) along the Casiquiare River in Territorio Federal Amazonas, southwestern Venezuela, is represented in NY by an isotype specimen, by a fragment of an isotype collection in F, and by photographs of the holotype in K and in B.

Spruce described the leaves (Trans. Linn. Soc. **22**: 297. 1859) as "(an constanter?) ternatim verticillata, 8–10 poll. [24–30 cm] longa, 2–3 [6–9 cm] poll. lata." The isotype specimen at New York shows leaf-blades only 15–16 cm long and 4–5.5 cm broad, while the leaves shown on the specimen photographed at

Kew measure as much as 22.5 cm long by 8.5 cm broad. In the collection of *Maguire, Wurdack, & Bunting 36640* from the Río Pacimoni (a tributary of the Río Casiquiare, whence the type locality) and of *Williams 14076,* the leaf-blades are 18–26 cm long and 8–11.5 cm wide and up to 21 cm long and 7.5 cm wide respectively, thus approaching closely the limits given in Spruce's original collection.

The matter of 3-verticillate leaves, as given in the original description, but questioned at the time as being constant, is found to vary to 4-verticillate. The *Maguire, Wurdack, & Bunting 36640* specimen, referred to above, has 4-verticillate leaves. Most of the collections examined, however, show 3-verticillate leaves.

At the time of Spruce's original description, no fruit was extant. However, based upon two present collections, considered as conspecific with *H. nitida,* the following emendation may be given: capsula lignosa magna transverse oblonga vel suborbiculari-quadrata complanata extus purpureo-nigra superficies cinerea supra medium cicatrice calycis circumdata 9–10 cm lata 8–9.5 cm alta, valvulis ad margines 3–3.5 mm crassis medio ad 7 mm crassis; seminibus magnis compressissimis late oblongis extremitatibus rotundatis 5.5 cm longis 3.2 cm altis vel latis.

Key to the Varieties of *Henriquezia nitida*

1. Lateral nerves scarcely evident beneath; leaf-blades relatively small, 9–17 cm long, 2.5–5.5 cm wide. 3d. var. *oblonga.*
1. Lateral nerves quite evident or prominulous beneath; principal leaf-blades relatively large and well-developed, 9–36 cm long, 3.5–15 cm wide.
    2. Petiolar glands usually 2; lateral pairs of nerves of leaf-blades 6–18 mm apart; leaves mainly 3-, rarely 4-verticillate. 3a. var. *nitida.*
    2. Petiolar gland 1; lateral pairs of nerves of leaf-blades 15–30 mm apart; leaves 4-verticillate.
        3. Lateral pairs of nerves of leaf-blades mainly 12–15; leaf-blades broadly obovate, conspicuously narrowed below the middle to the base; lower surface of leaf-blades with a prominulous subreticulate tertiary venation. 3c. var. *subcuneata.*
        3. Lateral pairs of nerves of leaf-blades mainly 9–12; leaf-blades oblong or oblong-obovate, gradually narrowed to the base; lower surface of leaf-blades with the tertiary venation inconspicuous, obsolete, or not subreticulate. 3b. var. *macrophylla.*

3a. **Henriquezia nitida** Spruce ex Benth. var. **nitida** Fig. 72, H–J.

Henriquezia nitida Spruce ex Benth. Trans. Linn. Soc. **22**: 297. 1859.

Distribution: Río Atabapo in Colombia, extreme western part of Territorio Federal Amazonas (Río Atabapo, Río Pacimoni, and Río Temi), Venezuela, and Rio Vaupes, state of Amazonas, Brazil.

COLOMBIA. Drowned river margin of Río Atabapo, just above Cacagual; tree 6–10 m; leaves 3-whorled; corolla white flushed with pink, the tube within pink spotted with orange beard on one side; alt. 130 m; frequent; 19 Nov 1953, *Maguire, Wurdack, & Bunting 36268* (NY). VENEZUELA. Amazonas: Yavita, Alto Orinoco; entre palmeras en las sabanetas; arbol de 6 m de altura con copa abierta; tronco 25 cm de diametro; madera dura, no es facil de cortar; fruta de color castaño, moteado, comprimido; exuda; alt. 128 m; 29 Marzo 1942, *L. Williams 14076* (F, VEN, US); 15 km above San Fernando de Atabapo; frequent on sandy banks; small or medium-sized tree; alt. 100 m; 17 Oct 1950, *Maguire 29261* (NY); along Río Temi below Yavita; frequent in caatinga; 20 Oct 1950, *Maguire 29322* (NY); Río Pacimoni 50 km above mouth; tree 40 m high, 50 cm diam; leaves in 4's; corolla flushed pink, orange-spotted and striped within; alt. 100–140 m; 27 Nov 1953, *Maguire, Wurdack, & Bunting 36640* (NY); ad flumina Casiquiari, Vasiva et Pacimoni, 1853–54, *R. Spruce 3690* (isotype NY, Photo NY, Photo of Berlin sheet F, NY, fragment of isotype F); "Plantae Yavitensis Nov 1845," ex herb. Vargasii (US). BRAZIL: Amazonas: basin of Rio Negro, Rio Vaupes; tree 20 ft high; caatinga; 11 May 1942, *Krukoff 12573/ 297* (F).

3b. Henriquezia nitida var. **macrophylla** (Ducke) Steyermark, comb. nov.

Henriquezia macrophylla Ducke, Notiz. Bot. Gart. Berl. **11**: 475. 1932; Arch. Jard. Bot. Rio de Janeiro **6**: 92. 1933.

Distribution. State of Amazonas, Brazil, along tributaries (Içana, Curicuriary, and Vaupes) of the Rio Negro.

BRAZIL. Amazonas: ad ripas fluminis Curicuriary affluentes Rio Negro superioris; 28 Nov 1929, *A. Ducke 22815* (holotype RIO, isotype US); Rio Curicuriary acima das cachoerias, margem; arvore pequeña; flores roses; 29 Nov 1936, *Ducke 293* (NY); Rio Içana, Masarico; árvore de 15–20 mts.; madeira dura; flôres róseo-avermêlhadas; 22 Oct 1947, *J. Murca Pires 699* (2 sheets, NY); Rio Issana, Tunuí; common along rocky banks; Oct 1947, *Schultes & Pires 8967* (2 sheets, F); Igarapé Piaiauara, Rio Curicuriari; tree about 40 ft high; bark shaggy, grey; wood relatively hard, white; 26–27 Apr 1948, *Schultes & Lopez 9857* (F); Igarapé da Chuva, Taracuá, Rio Vaupés, between Ipanoré and confluence with Rio Negro, 12 Nov 1947, *Schultes & Pires 9061* (US).

The isotype of *Henriquezia macrophylla* Ducke (*Ducke 22815*) has the leaves rounded and only slightly mucronate at the apex, and matches in size and shape some of the larger ones encountered in *H. nitida* var. *nitida*, such as in the collection of *Maguire, Wurdack, & Bunting 36640*. However, the lateral nerves of the leaf-blades of the isotype specimen are fewer and more widely separated. A topotype of *H. macrophylla* (*Ducke 293*), identified by Ducke as *H. macrophylla*, shows the leaf-blades more acutely obtuse or acutish, as do the other collections (except *Schultes & Pires 9061*). The isotype material may be interpreted as the less common variant of *H. macrophylla* having a more rounded apex of the leaf-blade.

When Ducke described *H. macrophylla*, its affinities were stated to be with *H. obovata* Spruce ex Benth. and *H. verticillata* Spruce ex Benth. Judging, however, by the persistent stipules, leaf shape, and nervation, as well as prominent, imbricate calyx-lobes divided all the way to their base, i.e., to the summit of the ovary, it is apparent that the true affinities of this taxon lie with *H. nitida* Spruce ex Benth. var. *nitida*. The main points of variance shown from *H. nitida* var. *nitida* by *H. macrophylla* are the generally acutish or acutely pointed leaf-blades (although rounded to broadly obtuse in the type collection of *H. macrophylla*), generally fewer pairs of lateral nerves more widely spaced, and generally a solitary petiolar gland.

The lateral nerves on the lower surface are of the slightly elevated type encountered in *H. nitida* var. *nitida* rather than of the prominently elevated type present in *H. verticillata*. Those on the upper surface of *H. verticillata* are prominently sulcate, whereas in *H. nitida* var. *nitida* and *H. macrophylla* they are merely impressed or even slightly elevated. Although the apex of the leaf-blades in *H. nitida* var. *nitida* are chiefly rounded or subtruncate, some of them occasionally are somewhat acutely obtuse, thereby exhibiting a transition to the generally acutish or acutely obtuse type characteristic of *H. macrophylla.* In most of the collections examined of *H. nitida* var. *nitida,* generally two petiolar glands are present, whereas only one is usually present in *H. macrophylla.* However, only one may be found in some specimens of *H. nitida* var. *nitida,* as in *Maguire, Wurdack, & Bunting 36640,* again indicating some variability in this character between the two taxa. In *Pires 699* the calyx-lobes are more conspicuously caudate or long-acuminate with tips 3–4 mm long instead of 1–2.5 mm long and less slender as in *Ducke 293.*

In view of the variations indicated above and intergradation of the various characters used for separation of the taxa, *H. macrophylla* is here considered as a variety within the *H. nitida* complex rather than as a distinct species.

3c. **Henriquezia nitida** var. **subcuneata** Steyermark, var. nov.

Arbor 6.5–12-metralis; stipulis lanceolatis vel lineari-lanceolatis acuminatis 20–35 mm longis 3–4 mm latis cano-fulvo-tomentellis; foliis 4-verticillatis, petiolatis; petiolis 15–22 mm longis glabris; petioli glandula basilari una suborbiculari vel horizontaliter oblonga ca. 2 mm alta 3–4 mm lata ventraliter inserta; laminis coriaceis subtus pallidioribus late obovatis apice late obtusis vel acute obtusis basin versus manifeste angustatis subcuneatisque 27–36 cm longis 10–14 cm latis glabris; nervis lateralibus utroque latere 12–15 arcuato-adscendentibus ante marginem laxe tenuiterque anastomosin facientibus utrinque prominentibus 20–25 mm disjunctis, subtus venulis saepius magis bene reticulatis; inflorescentia dichotome cymosa 13 cm alta 15 cm lata, ramis lateralibus primariis quaternatim verticillatis 2.5–3.5 cm longis, in omnes partes fulvo-tomentellis, rhachibus internodiis 2.5–3 cm longis disjunctis, omnibus cum ramis secundariis duobus 1.5–2 cm longis, omnibus cum ramis tertiariis duobus ca. 1 cm longis; pedicellis 5–15 mm longis; bracteis in anthesi caducis; calycis lobis 4 usque ad basin partitis ovato-lanceolatis acutis vel acuminatis 10–11 mm longis 3.5–4 mm latis cano-fulvo-tomentosis; corollis maturis non visis; capsula non visa.

Distribution. Upper Rio Negro, state of Amazonas, Brazil.

BRAZIL. Rio Negro, Preto, Campina; open country; tree 20 ft; flowers rose with red strip; 18 Nov 1947, *R. L. Froes 22885* (holotype NY, isotype US).

This variety may be distinguished by the large obovate leaf-blades which are long-tapering to the base, by the somewhat prominent, subreticulate venation, and by the prominent lateral nerves on both lower and upper surfaces.

3d. **Henriquezia nitida** var. **oblonga** (Spruce ex Benth.) Steyermark, comb. nov.

Henriquezia oblonga Spruce ex Benth. Trans. Linn. Soc. **22**: 297. 1859.

Arbor 4–5 m alta; foliis 3–4-natim verticillatis anguste oblongis vel apiculatis, laminis 9–17.5 cm longis 2.5–5.5 cm latis subtus pallidioribus, supra nervis lateralibus impressis subtus vix prominulis vel subobsoletis utroque latere 12–15; petiolis 9–30 mm longis glabris vel minute parce puberulentibus; petioli duobus glandulis orbicularibus vel ovalibus 0.7–1 mm altis 0.7 mm latis ventraliter insertis; stipulis lanceolatis vel lanceolato-linearibus acuminatis 12–17 mm longis 1.2–2.5 mm latis dense tomentellis; inflorescentiis 9–15-floris 4.5–9 cm longis (altis) 6.5–15 cm latis, ramis lateralibus 1.5–2.2 cm longis, pedicellis 4–12 mm longis velutino-tomentosis pilis fulvis dense vestitis; calyce 15–22 mm longo, lobis 4 inaequalibus ovatis vel elliptico-ovatis acutis vel acuminatis duobus majoribus latioribus magis acuminatis 12–17 mm longis 4.5–8 mm latis usque ad ovarium divisis; calycis tubo 3–4 mm longo 5 mm lato; corollis 40–55 mm longis late infundibuliformibus basi tubo 3.5–8 mm longo 4–5 mm lato extus dense sericeo-velutinis intus infra zonam barbatam 4–8 mm glabro vel papillato, supra tubum angustum subito ampliatis, limbo 21–30 mm longo superne 18–30 mm lato extus mollissime tomentuloso, lobis 5 late ovatis apice rotundatis 12–18 mm longis 10–19 mm latis extus tomentulosis intus glabris uno lobo basi puberulo excepto; staminibus inaequalibus duobus brevioribus, antheris 5–7 mm longis, filamentis 11–16 mm longis.

As the original description of *H. oblonga* was inadequately drawn from fruiting material, a more complete emended description, supplemented by flowering material, has been given above.

Distribution. Southwestern Venezuela, Territorio Federal Amazonas, along the Río Atabapo and Caño Catua and tributaries.

VENEZUELA. Amazonas: frequent on the Río Atabapo, an affluent of the Orinoco near the mouth of the Casiquiare; small tree of about 18 ft in height, with spreading branches; Jun 1854, *Spruce 3702* (photo NY); along Caño Catua at northwestern base of Cerro Yapacana; occasional; small or medium riverine tree; leaves 4 per node; buds pink; sepals pale tinged pink; corolla flushed pink with orange-red spots and median line within; alt. 125 m; 19 Nov 1953, *Maguire, Wurdack, & Bunting 36557* (NY); Atabapo, cerca de la desembocadura del Río Atacavi; 4 Sep 1960, *Foldats 3706* (VEN).

The *Maguire, Wurdack, & Bunting 36557* collection differs in several details from that of *Foldats 3706* in having 4-verticillate leaves with much longer, more puberulent petioles 15–30 mm long, no apparent petiolar glands, larger corollas 48–55 mm long instead of 40–42 mm, and anthers 5 instead of 7 mm long. The larger corolla appears to be due to harder pressing. The longer, more puberulent petioles may prove at a future time to have taxonomic significance, but, at present writing, are being interpreted as within the limits of variability manifested by this taxon.

All the specimens examined of *H. nitida* show predominantly large oblong leaf-blades broadly rounded or subtruncate to broadly obtuse at apex, often retuse or mucronulate, and with the lateral nerves on the lower leaf-surface prominent or manifest. When Spruce described *H. oblonga* (loc. cit. 297), based on his number *3702* from the Río Atabapo of southwestern Venezuela, he stated that it differed from *H. nitida* in having smaller leaf-blades with relatively longer petioles, and less shining leaf-blades, paler below and with the lateral nerves scarcely evident. He admitted, however, that his *H. oblonga*, collected only in the fruiting stage, might prove to be possibly a variety only of *H. nitida*, which he collected in the flowering state. Two recent collections, both in anthesis, which I have judged to be conspecific with *H. oblonga*, are *Foldats 3706* from near the type locality of the Río Atabapo station and *Maguire, Wurdack, & Bunting 36557*. Both collections show the smaller leaf-blades, paler beneath with the lateral nerves of the lower leaf surface scarcely developed and not obvious, and match the characters given in the original description as well as the photograph of the holotype from Kew Herbarium deposited in The New York Botanical Garden Herbarium. The leaves of the *Foldats 3706* collection are 3-verticillate, those of the *Maguire, Wurdack, & Bunting 36557* collection 4-verticillate. Apparently, 3-verticillate leaves are represented by the holotype specimen photographed at K.

Although it might appear that these smaller-leaved trees with the lateral nerves scarcely evident on the lower surface of the leaves represent a distinct species, intergradation occurs in leaf size between *H. nitida* and *H. oblonga*. No floral distinctions can be found between these two taxa, and they are, therefore, considered only as varieties differing in vegetative characters.

4. **Henriquezia longisepala** Bremekamp, Act. Bot. Neerl. **6**: 376. 1957.

Distribution. Amazonian Brazil.

Known only from the state of Amazonas, Rio Negro, São Felipe, Igara pé Touri, 27 Sep 1952, *Froes 28781* (holotype U, isotype IAN).

Hillia Jacq. Enum. Pl. Carib. **3**. 1760.

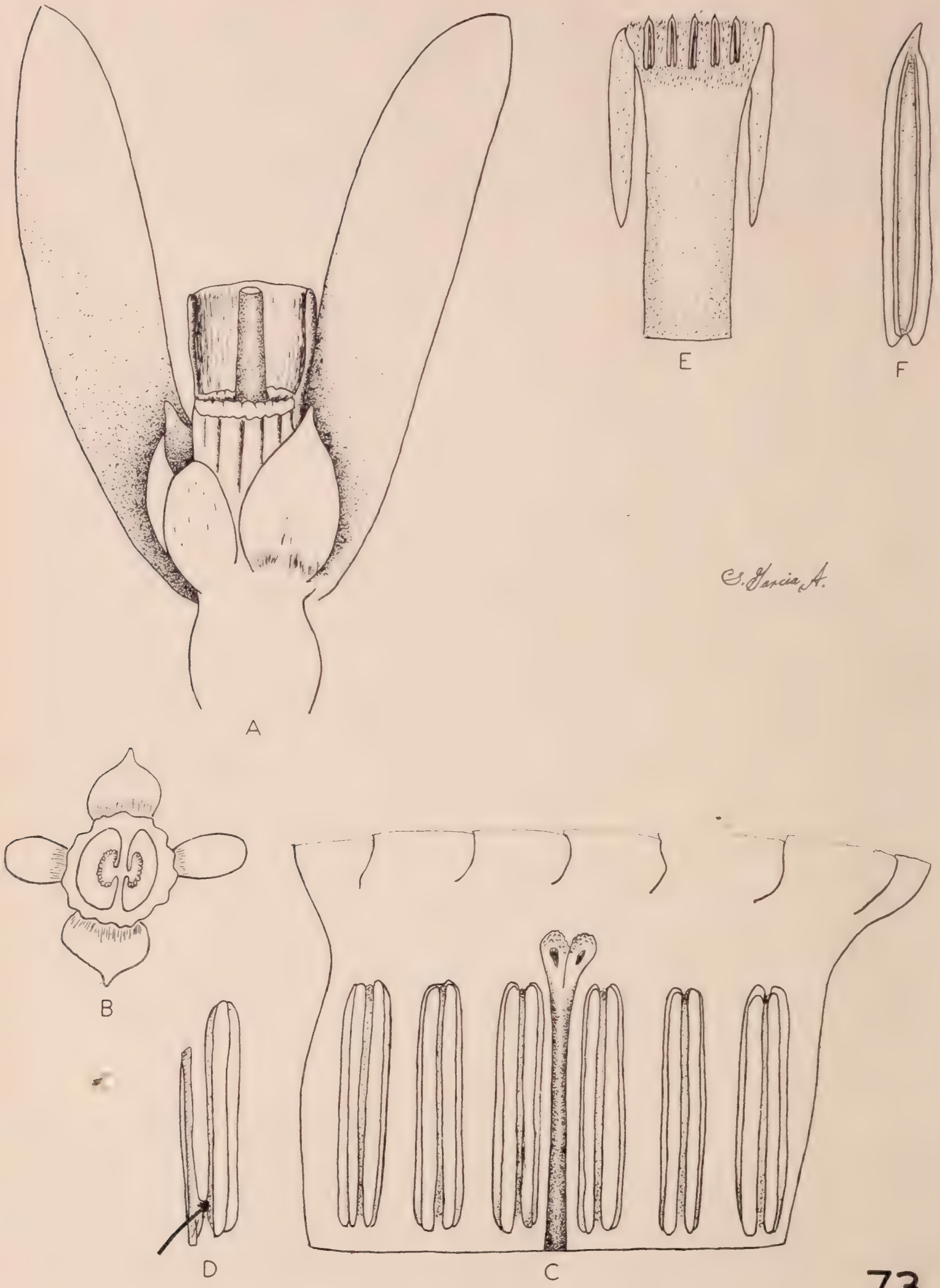
Hillia maguirei Steyermark, sp. nov. Fig. 73, A–D.

Frutex 2–3-metralis, omnino glaber, ramulis fusco-purpureis superne saepe exfoliantibus subquadrangularibus; stipulis deciduis eis basin florum subtendentibus submembranaceis late oblongis vel ovato-oblongis apice rotundatis 17–21 mm longis 6.5–8 mm latis; foliis breviter petiolatis, petiolis crassiusculis 2–5 mm longis; laminis coriaceis ovato- vel oblongo-ellipticis apice abrupte acuminatis basi acutis vel subacutis 5–8 cm longis 2.5–3.5 cm latis, costa media subtus subprominenti, nervis lateralibus utroque latere obscuris 2–3 adscendentibus fere rectis, nervulis obsoletis; floribus terminalibus solitariis sessilibus stipulis duabus involucratis; bracteis basin florum suffultis 4, duabus exterioribus ovatis abrupte acuminatis basi costa media prominenti 5–6 mm longis 3.5–4 mm latis, duabus interioribus brevioribus oblongis apice rotundatis cucullatis breviter notatis 3–3.5 mm longis 2.2–2.5 mm latis; hypanthio late oblongo apice truncato repando-ruguloso 6.5 mm longo 4 mm lato costulato; calyce nullo, 6 cicatricibus solum inter apicem hypanthii et basin ovarii expositis; corolla alba longe hypocrateriformi ad faucem paullo dilatato, tubo 11–12 cm longo basi 5–5.5 mm lato fauce 7–10 mm lata, lobis 6 linearibus vel lanceolato-linearibus apice obtusis 3.5–4.5 cm longis 6–8 mm latis; staminibus 6, antheris inclusis sessilibus linearibus apice rotundato-truncatis 8 mm longis 1.5 mm latis; stylo glabro 11.5 cm longo, stigmatibus bilobatis papillosis; capsulis cylindricis apice truncatis 7.5 cm longis 7.5–8 mm latis glabris; seminibus non visis.

VENEZUELA. Amazonas: Serrania Yutaje, Río Manapiare; infrequent among boulders on hillsides; shrub 2–3 m high; flowers white, fragrant; pods dehiscent down on side; seeds comose with long brown hair; alt. 1750 m; 17–19 Feb 1953, *B. Maguire & C. K. Maguire 35287* (holotype NY); same locality; infrequent in intervals; alt. 1800 m; 17–19 Feb 1953, *B. & C. K. Maguire 35296* (paratype NY).

This showy-flowered species resembles the widespread *H. parasitica* Jacq., which also occurs in the Venezuelan Guayana Highlands on the slopes and summits of some of the sandstone table-mountains. From *H. parasitica* it may be distinguished by the lack of calyx-lobes, which are instead represented by 6 scars, by the longer corolla-lobes, broader corolla-tube, nearly subsessile to more shortly petiolate leaves, which are gradually narrowed to an acute base with a much shorter petiole and less abruptly long-acuminate apex, by the shrub and terrestrial instead of epiphytic or climbing habit (the latter condition frequent in the West Indian specimens of *H. parasitica*), and by the loose, often exfoliating epidermis of the purple-brown younger branches, as contrasted with the tight gray epidermis of the branches of *H. parasitica*.

From *H. tubiflora* Cham. [*H. illustris* (Vell) K. Sch.] it may be distinguished by the longer corolla-tube and lobes, absence of calyx, fewer pairs of lateral



73

FIG. 73. A–D, *Hillia maguirei.* A, base of flower with most of corolla detached, × 4. B, ovary, transverse section, showing four calyx-like bracts viewed from above with striations shown on one bract within, × 4. C, uppermost portion of corolla-tube, lower portion of corolla-lobes, stamens, and upper part of pistil, in relative positions of dissected corolla, × 4.5. D, stamen, dorsal view, showing (by black line) place of attachment of anther to corolla-tube, × 4.5. E–F, *Kotchubaea neblinensis.* E, corolla, spread open with two of the corolla-lobes shown in position, × 1. F, anther, ventral view, × 6.

nerves of the leaf-blades, and short-petiolate leaf-blades. From *H. killippii* Standl. of Colombia it differs in the lack of transversely roughened or wrinkled branches, thicker, less prominently nerved leaf-blades, longer corolla-tube, and broader corolla-lobes which are more rounded at the apex. From *H. macromeris* Standl., also of Colombia, it may be distinguished by the shorter corolla-tube with 6 instead of 5 corolla-lobes, and by the thicker leaf-blades with fewer pairs of lateral nerves which are not prominent as they are in *H. macromeris.*

Hillia psammophila Steyermark, sp. nov. Fig. 74.

Planta scandens ligneosa epiphytica omnino glabra, ramis gracilibus; stipulis caducis; foliis petiolatis, petiolis 6–11 mm longis crassiusculis; laminis coriaceis

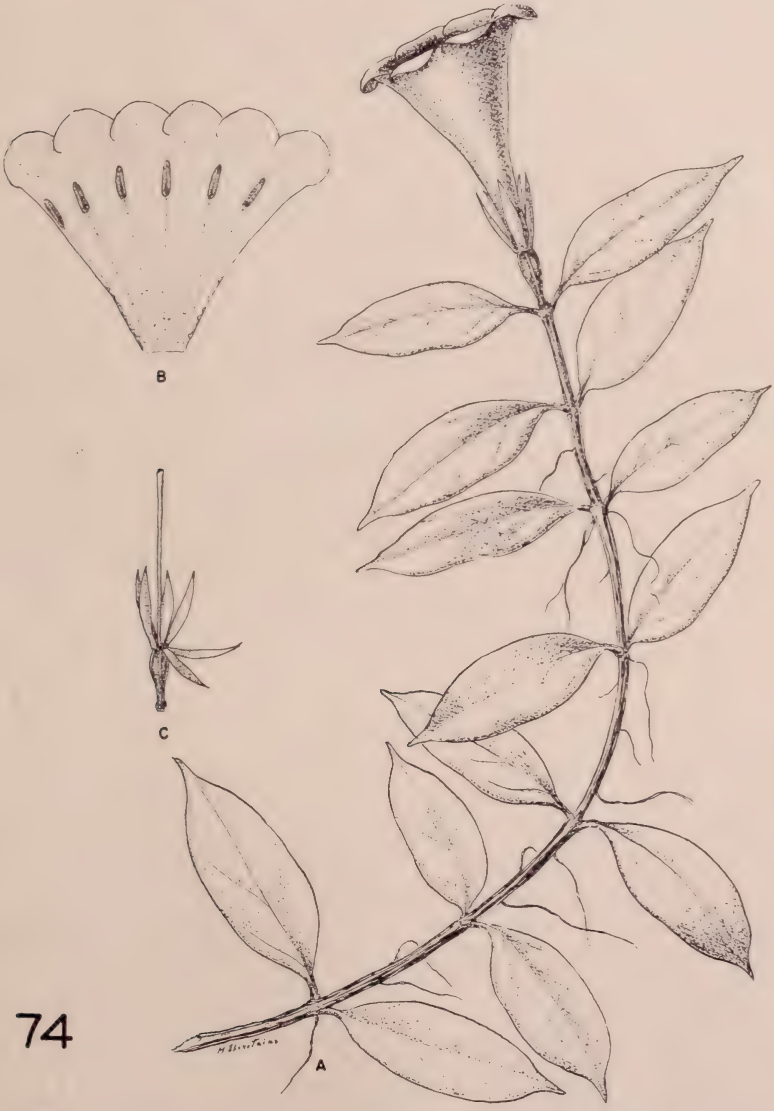


FIG. 74. *Hillia psammophila.* A, habit, × ½. B, corolla, spread open, × ½. C, calyx and pistil, × ½.

ellipticis vel ovato-ellipticis apice abrupte acuminatis acumine 4–9 mm longo basi acutis 4.5–6.5 cm longis 2–3 cm latis costa media subtus paullo subprominula, nervis lateralibus utroque latere 3–4 supra obscuris vel obsoletis subtus nullis, nervulis nullis; floribus terminalibus solitariis pedicellatis, pedicellis 4–5 mm longis; hypanthio turbinato-oblongo 7 mm longo 3.5 mm lato; calyce in 6 lacinias erectas lineari-lanceolatas acutas vel acuminatas 18 mm longas 3–3.5 mm latas diviso; corolla luteo-viridi late infundibuliformi, tubo supra basin 2 cm gradatim ampliato 6 cm longo basi 5 mm lato fauce 35 mm lata intus glauca, lobis 6 depresso-suborbicularibus rotundatis 10 mm longis 15 mm latis; staminibus 6, antheris inclusis prope apicem tubi corollae infra basin loborum corollae 15 mm insertis, lineari-oblongis utrinque rotundatis 7.5 mm longis 2 mm latis subsessilibus; filamentis 1.5 mm longis; stylo glabro 4.2 cm longo; stigmatibus 2 obovatis acutiusculis 2 mm longis; disco 1 mm alto; capsula non visa.

VENEZUELA. Edo. Bolívar: vicinity of camp 125 at km 125 between Luepa and Cerro Venamo, vicinity of Cerro Uei; forest; alt. 1100 m; epiphytic liana; leaves coriaceous; calyx-tube dark green, lobes paler green with lavender; corolla-tube and lobes yellow-green, glaucous within; anther lavender-brown; 20 Apr 1960, *J. A. Steyermark & S. Nilsson 392* (holotype VEN, isotype NY).

This is the first of the *Hillia* group of species with infundibuliform green corollas to be found in Venezuela. It is thus far known from the sandstone escarpment lying just west of Cerro Venamo near the Venezuela-British Guiana frontier.

It is related to *H. goudotii* Standl. of Colombia, *H. ulei* Krause of Peru, and *H. viridiflora* Kuhlmann & Silveira and *H. saldanhaei* Schumann of Brazil. From *H. goudotii* it differs in the solitary instead of ternate flowers, longer corolla-tube much broader above the middle, longer corolla-lobes, shorter calyx-lobes, and obsolescent lateral nerves of the smaller leaf-blades.

From *H. viridiflora* it is distinguished by the shorter pedicel of the flower, the broader calyx-lobes, longer corolla which is much broader at the throat, larger corolla-lobes, longer anthers, longer style, non-flabelliform nerved leaves, and acute to acuminate calyx-lobes. From *H. saldanhaei* it may be distinguished by the solitary flowers, 6 instead of 5 corolla-lobes, bilobed instead of capitate stigma, and acuminate instead of rounded apex of the leaf-blades. From *H. ulei* it differs in the larger corolla and calyx-lobes and obsolescent-, instead of palmately-nerved leaf-blades.

Kotchubaea Fisch. ex DC. Prod. **4**: 373. 1830.

The genus has been previously known from Amazonian Brazil and Peru, and from French and possibly British Guiana. During a study of the genus, two new species collected in the Venezuelan Guayana, one from the base of the slopes of Cerro de la Neblina, the other from the base of Chimantá Massif, form the basis for the first records of the genus in Venezuela, while two additional species, here described as new, one from Peru, the other from Brazil, have been encountered in the material examined in F, NY and US. I am grateful to the curators of these institutions for the courtesy of studying this material.

Kotchubaea has a distribution following the Amazon, Rio Solimões, and Rio Negro in Brazil, Amazonian Peru along the Río Amazonas in the Dept. Loreto, thence ascending between 1200–1600 m in Peru in the drainage of the Río Muyo (tributary of the Río Huallago) of the Dept. San Martin, extending northward in Venezuela following a tributary of the Río Negro, to Cerro de la Neblina and

along the Río Tirica (tributary to the Río Caroni) to Chimantá Massif. In French Guiana it is known from low altitudes in the vicinity of Cayenne and along the Río Maroni.

The species are found in tall forest which is not inundated, most of the species inhabiting the forests of low altitudes from slightly above sea level to 100 m. Three species are found between 600–1600 m: *K. neblinensis* at 600–700 m, *K. longiloba* at 1000 m, and *K. montana* at 1200–1600 m. The species are characterized by various degrees of indument on the outer surface of the corolla-tube of the staminate flowers. In *K. sericantha* the indument is densely sericeous with relatively elongated hairs, whereas in the other species of the genus the hairs are very short. In *K. neblinensis, K. montana, K. duckei,* and *K. palustris* only the basal 1–8.5 mm of the corolla-tube is glabrous, in *K. longiloba* the glabrity extends up to 17 mm of the tube, in *K. semisericea* the glabrity extends up the lower 25–50 mm of tube, while in *K. insignis* all the outer surface of the tube is glabrous.

Staminate flowers are known from all the species and are apparently the ones more commonly collected. Pistillate flowering specimens are known only from *K. sericantha, K. palustris,* and *K. insignis.* In *K. sericantha* the staminate flowers are fasciculate in umbelliform cymes and lack a common peduncle, whereas in the other species of the genus the pedicels of the staminate flowers are borne on a common peduncle of varying length.

The pubescence on the lower surface of the leaf-blades is best developed in the Peruvian *K. montana* and *K. urophylla,* the former ascending to an elevation of 1200–1600 m. Various degrees of puberulence of the petioles and midribs and lateral nerves of the lower leaf-surfaces are mainly encountered in *K. palustris* and *K. sericantha.* The corolla-tube is broader and the pedicels are stouter and more strongly angled in *K. sericantha* than in the other species of the genus.

Key to the Species of *Kotchubaea*

1. Staminate flowers 6-merous, sessile or subsessile in subcapitate clusters; staminate calyx densely pilose. 7. *K. urophylla.*
1. Staminate flowers 7–10-merous, obviously pedicellate in cymes, corymbose-cymes, or umbels; staminate calyx glabrous to puberulent.
    2. Corolla-lobes (45–50 mm long) of staminate flowers manifestly longer than the corolla-tube (22–35 mm long); calyx of staminate flowers with teeth 1.5–2 mm long; lateral pairs of nerves of leaf-blades 4–5. 9. *K. longiloba.*
    2. Corolla-lobes (15–41 mm long) of staminate flowers manifestly shorter than or at most nearly equaling the corolla-tube (20–70 mm long); calyx of staminate flowers without teeth or these only 0.2–1.2 mm long; lateral pairs of nerves of leaf-blades 5–18.
        3. Tertiary venation on lower surface of leaf-blades manifestly reticulate between lateral nerves; calyx-tube of staminate and pistillate flowers granular-rugulose and minutely puberulent without; upper half of corolla-tube of staminate and pistillate corollas mainly 5–12 mm broad, becoming 15–25 mm broad at orifice; staminate pedicels fasciculate, not arising from a common elongated peduncle. 1. *K. sericantha.*
        3. Tertiary venation obsolete or not manifestly reticulate on lower surface of leaf-blades; calyx-tube of staminate and pistillate flowers glabrous or puberulent without, not granular-rugulose; upper half of corolla-tube of staminate and pistillate flowers more slender, 2.5–6 mm broad, becoming 5–15 mm broad at orifice; staminate pedicels arising from a common elongated peduncle.
            4. Corolla-tube (not including expanded throat) of staminate flowers externally glabrous throughout; pistillate corolla on peduncle 1–3 cm long. 10. *K. insignis.*
            4. Corolla-tube (not including expanded throat) of staminate flowers externally gray- or buff-sericeous or tomentulose throughout or partly so.

5. Upper part of stems of flowering branches and midrib, lateral nerves, and face of lower side of leaf-blades minutely pilosulous to subhirtellous; at altitudes 1200–1600 m. 6. *K. montana.*
5. Upper part of stems of flowering branches and lower surface of leaf-blades, including midrib and lateral nerves, glabrous or nearly so; at altitudes between sea level and 700 m.
    6. Corolla-tube of staminate flower 55–70 mm long; corolla-tube of staminate flower (excluding the expanded throat) glabrous in lower 25–50 mm. 8. *K. semisericea.*
    6. Corolla-tube of staminate flower 15–45 mm long; corolla-tube of staminate flower (excluding the expanded throat) glabrous only in basal 1–8.5 mm.
        7. Calyx of staminate and pistillate flowers minutely puberulous or granular-puberulent externally.
            8. Summit of calyx subtruncate without an obviously denticulate margin; main peduncle of staminate inflorescence 1 cm or less long; staminate corolla-tube mainly (20–)30–35(–40) mm long; staminate corolla-lobes usually eight, 20–25 mm long; corolla-tube within glabrous in basal 1/3. 2. *K. palustris.*
            8. Summit of calyx obviously denticulate; main peduncle of staminate inflorescence 1.5–5 cm long; staminate corolla-tube 22–28 mm long; staminate corolla-lobes usually seven, 15–20 mm long; corolla-tube within glabrous in basal 1/5. 3. *K. micrantha.*
        7. Calyx of staminate flowers, at least, glabrous externally.
            9. Calyx of staminate flower 6–10 mm long; basal 1–2 mm of corolla-tube of staminate flower glabrous; lateral pairs of nerves of leaf-blades 4–7. 4. *K. neblinensis.*
            9. Calyx of staminate flower 13–18 mm long; basal 5–8.5 mm of corolla-tube of staminate flower glabrous; lateral pairs of nerves of leaf-blades (7–)8–13. 5. *K. duckei.*

1. **Kotchubaea sericantha** Standl. Field Mus. Bot. Ser. **8**^{5}: 355. 1931; Ducke in Arch. Inst. Biol. Veg. **4**^{1}: 63. 1938.

Kotchubaea speciosa Ducke, Notiz. Bot. Gart. Berl. **11**: 478. 1932; Arch. Jard. Bot. Rio de Janeiro **6**: 99. 1933.
Einsteinia speciosa Ducke, Ann. Acad. Bras. Sci. **6**: 106. *pls. 1, 2.* 1934.
Einsteinia sericantha (Standl.) Ducke, Ann. Acad. Bras. Sci. **7**: 181. 1935.

Distribution. Amazonian Brazil and Peru.

BRAZIL. Amazonas: prope Fonteboa, regionis fluvii Solimões; silva humosa non ínundabile; arbor media; floris albis odoratis; 26 Nov 1927, *A. Ducke 22911* (isotype of *Kotchubaea speciosa,* NY, US, photo of isotype of *K. speciosa* from P at F; staminate); Manaos, ad urbem; in silva non inundabili loco leviter paludoso; 15 Apr 1932, *Ducke 24008* (isotype of *Einsteinia speciosa,* NY; pistillate); same locality and date, *Ducke 24007* (isotype of *Einsteinia speciosa,* NY; staminate); Tefé; arvore pequena de 5 metros; 20 Oct 1948, *Pires 1304* (2 sheets, NY); circa cataractum Porteira fluminis Trombetas, *Ducke 22921* (RIO); Manaos, loca Pensador; silva non inundabili loco humido; arbor parva; flor. albis odoratis; 4 Dec 1936, *Ducke 270A* (NY, 2 sheets; staminate); Manaos, loco Cachoeira do Mindú; silva non inundabili leviter paludosa; 14 Apr 1936, *Ducke 270* (NY, 2 sheets; pistillate); Manaos, Pensador; silva non inundabili; loco humido; arbor parva; flor. albis odoratis; 4 Dec 1936, *Ducke 162* (NY; staminate); Manaos, Cachoeira do Mindú; silva non inundabili aliquanto paludosa; 14 Apr 1936, *Ducke 165* (NY; pistillate). PERU. Dept. Loreto: Mishuyacu, near Iquitos; forest; alt. 100 m; tree 12 m high; flowers white; April 1930, *G. Klug 1260* (holotype of *Kotchubaea sericantha,* F, isotypes, NY, US).

In this species a resinous exudate is commonly developed on the upper part of the branches at the base of the pedicels, petioles, and on the lower part of the leaf-blades. The stipules are exceptionally large in this species. The upper part of the branches are usually granular-puberulent.

2. **Kotchubaea palustris** Ducke, Arch. Inst. Biol. Veg. **4**^{1}: 62–63. 1938.

Distribution. Amazonian Brazil-Colombia frontier, in drainage of the upper Rio Negro along Rio Macacuny.

BRAZIL. Amazonas: Rio Negro superioris, Igarape Macacuny; ad ripas paludosas; arbor parva; floris albis; 20 Sep 1935, *A. Ducke 34642* (staminate) and *34643* (pistillate) (isotype US); Macacuny, circa Cucuhy, Rio Negro superioris; in silvis humilioribus secus ripas paludosas fluminis; 20 Sep 1935, *Ducke 219* (NY). Also recorded as seen by Ducke ''in paludibus secus Igarapé Jurupary, fluminis Vaupés inferius affluentem'' in adjacent Colombia, which report may refer to the closely related *K. micrantha.*

3. **Kotchubaea micrantha** Steyermark, sp. nov.

Arbor dioica, ramulis glabris; stipulis persistentibus ovatis apice anguste obtusis 5–9 mm longis subglabris vel extus puberulentibus marginibus ciliolatis; foliis adultis glabris petiolatis vel superioribus subsessilibus, petiolis 2–5 mm longis glabris; laminis coriaceis late obovatis vel oblongo-obovatis apice rotundatis vel subacutis basi obtusis vel subacutis 8–14 cm longis 4–9 cm latis glabris, nervis lateralibus utroque latere 5–7 supra tenuissime impressis subtus subprominentibus; *floribus masculis* cymis pedunculatis, pedunculo 1.5–5 cm longo glabro, irregulariter 6–13-floris dispositis, pedicellis 2–5 mm longis puberulentibus; pedunculis prominentibus 1.5–5 cm longis angulatis glabris; *calyce masculo* cylindrico-tubuloso 7–9.5 mm longo 3.5–4.5 mm diam extus puberulent intus dense villoso basi glabro 7 mm excepto, apice 7-denticulato dentibus late deltoideis subobtusis vel acutis 0.5 mm longis; *corolla mascula* alba hypocrateriformi tubo 22–28 mm longo 3–3.5 mm lato, superne paullo ampliato fauce 5 mm diam, 6–7 mm longo; tubo extus dense cano-sericeo intus dense sericeo, lobis 7 lineari-lanceolatis subfalcatis attenuatis apice subacutis 15–20 mm longis 1.5–3.5 mm latis utrinque canotomentellis; staminibus 7, antheris lineari-oblongis 5–5.5 mm longis apice acumine late lanceolato acuto 0.5 mm longo basi obtuso; floribus femineis non visis; bacca non visa.

Distribution: southwestern Venezuela and adjacent Colombia.

VENEZUELA. Territorio Federal Amazonas: en los margenes del Alto Río Atacavi; arbolito con flores blancas; bastante común; los troncos durante la estación lluviosa sumergidos en el agua negra; 7 Sep 1960, *E. Foldats 3758* (holotype VEN, isotype NY).

COLOMBIA. Amazonas-Vaupés: Rio Apaporis, Jino-Gojé, entre los rios Paraparana y Popeyaká; alt. 250 m; arbol 15 m; flores blancas muy aromaticas; hojas verde claro; 3–11 Sep 1952, *H. Garcia Barriga 14342* (paratype US).

This species is distinguished by the elongate peduncle of the staminate inflorescence and by the small corollas. It is noteworthy also for the broadly rounded apex of the leaf-blades and the densely villous interior of the upper two-thirds of the corolla-tube.

4. **Kotchubaea neblinensis** Steyermark, sp. nov. Fig. 73, E–F.

Arbor dioica 20-metralis, ramulis glabris; stipulis persistentibus suborbicularibus apice rotundatis 4 mm longis glabris marginibus ciliolatis exceptis; foliis adultis glabris petiolatis, petiolis 7–15 mm longis glabris; laminis subcoriaceis vel coriaceis oblongo-ellipticis apice obtusis vel rotundatis vel obtuse acutis basi acutis 7–14.5 cm longis 3–7 cm latis glabris, nervis lateralibus utroque latere 4–7 supra tenuissime impressis subtus leviter prominulis; *floribus masculis* in cymis corymbosis irregulariter 4–6-floris dispositis pedicellis 0.8–4 cm longis glabris; *calyce masculo* tubuloso obconico-turbinato 6–10 mm longo 7 mm lato apice ciliolato aliter extus glabro intus toto dense flavido-canosericeo apice truncato vel subtruncato; *corolla mascula* alba vel flavido-alba hypocrateriformi, tubo 35–45 mm longo basi 2.5–4 mm diam, superne ampliato fauce 10–11 mm diam, 7–10 mm longa, tubo extus todo cano-puberulenti basi ipsa glabra 1–2 mm excepta, intus fauce dense flavido-villosa 9–10 mm longa pilis adpressis ad 2 mm longis aliter glabra; lobis descendentibus 8 lineari-lanceolatis apice acutis angustatis 29–31 mm longis 2.5–4 mm latis utrinque cano-pulverulentibus; staminibus 8 sessilibus antheris lineari-oblongis 7–7.5 mm longis 0.9–1 mm latis apice acumine lanceolato acuminato 1 mm longo; stylo 3.8 cm longo inferne 2.7 cm longo glabro superne 1.2 cm longo piloso; stigmatibus oblongo-lanceolatis 4.5 mm longis glabris; floribus femineis non visis; bacca non visa.

VENEZUELA. Amazonas: Cerro de la Neblina; occasional in forest just north of Camp 3; alt. 650–700 m; tree 20 m × 18 cm; flowers white, faintly green flushed, fading to cream; 17 Nov 1957, *B. Maguire, J. Wurdack, W. M. Keith, & C. K. Maguire 42084* (holotype NY).

This species finds it closest relationship with *K. palustris* Ducke of the upper Rio Negro. It differs from *K. palustris* in the glabrous outer surface of the staminate calyx-tube, glabrous stipules except for their ciliolate apex, leaf-blades glabrous throughout, longer petioles and pedicels, fewer pairs of lateral nerves, and predominantly obtuse or rounded apex of the leaf-blades.

5. **Kotchubaea duckei** Steyermark, sp. nov.

Arbor dioica sat magna, ramulis glabris vel subglabris apicibus glutinosis; stipulis persistentibus late ovatis vel suborbiculari-ovatis apice rotundatis vel obtusis basi connatis 5–7 mm longis apice ciliolatis ceterum glabris; foliis petiolatis, petiolis 12–25 mm longis supra concavis longitudine sulcatis glabris vel infra granulari-puberulentibus; laminis subcoriaceis subtus pallidioribus late ellipticis vel obovato-ellipticis apice obtuse acutis vel subobtusis basin versus cuneatim angustatis 12–22 cm longis 3.5–10.5 cm latis supra nitidis glabris subtus glabris vel glabratis, nervis lateralibus utroque latere 7–13 utrinque leviter impressis, nervulis subtus subobsoletis; *floribus masculis* in cymis corymbosis irregulariter 6–8-floris dispositis, pedicellis 18–30 mm longis erectis glabris; *calyce masculo* tubuloso 13–18 mm longo 6.5–7.5 mm lato extus glabro intus dense sericeo apice ciliolato truncato vel irregulariter repando-denticulato dentibus late deltoideis 0.2–0.8 mm longis; *corolla mascula* hypocrateriformi alba demum lutescenti, tubo 35 mm longo 3–4.5 mm lato superne abrupte ampliato fauce 7–10 mm longo 10 mm lata, tubo extus breviter cano-sericeo in parte basilari glabra 5–8.5 mm excepta intus glabro, fauce extus dense cano-sericea intus dense sericea, lobis 8 lineari-lanceolatis apice obtuse attenuatis 28–34 mm longis 3.5–5 mm latis utrinque cano-tomentellis; staminibus 8, antheris lineari-oblongis 8.5–9 mm longis apice acumine lanceolato acuminate plerumque 1–1.2 mm longo; stylo 28 mm longo parte superiore 18 mm pilosula infra glabra, stigmatibus crassis lineari-oblongis 8 mm longis; flores femineis non visis; bacca non visa.

BRAZIL. Amazonas: São Paulo de Olivença; silva non inundabili; arbor sat magna; floribus albis demum lutescentibus, odoratis; 5 April 1944, *A. Ducke 1557* (holotype US, isotypes F, NY).

This species was originally determined by Dr. Ducke as *K. semisericea* Ducke, but differs from that species in the shorter corolla-tube of the staminate flower with the glabrous outer surface of the tube occupying a much smaller proportion of the tube than in *K. semisericea.* The new taxon appears more closely related to *K. neblinensis* Steyerm., from which it differs in the relatively longer corolla-lobes in proportion to the corolla-tube of the staminate flowers, the longer calyx-tube of the staminate flowers, and the larger leaf-blades with more numerous pairs (10–13) of lateral nerves.

6. **Kotchubaea montana** Steyermark, sp. nov.

Arbor dioica 8-metralis, ramulis annotinis juvenilibusque puberulentibus subhirtellisque; stipulis persistentibus late triangularibus apice rotundatis vel obtusis 3–5 mm longis extus strigillosis ciliolatis; foliis petiolatis, petiolis 8–10 mm longis supra concavis longitudine sulcatis minutissime puberulis; laminis firme membranaceis elliptico-obovatis apice plerumque abrupte acuminatis basi cuneatim angustatis 9.5–14.5 cm longis 3.5–7 cm latis subtus per omnes partes puberulis, nervis lateralibus utroque latere 7–8 adscendentibus non anastomosin facientibus nervulis subtus obsoletis; *floribus masculis* in cymis corymbosis irregulariter 7-floris compositis, pedicellis 15–25 mm longis glabris; *calyce masculo* campanulato-tubuloso 10–13 mm longo 6–8 mm lato extus glabro intus toto dense cano-sericeo apice irregulariter repando-denticulato dentibus late deltoideis obtusis plerumque 0.2–0.5 mm longis; *corolla mascula* flava (teste Klug) hypocrateriformi tubo 43–45 mm longo 4–5 mm lato superne ampliato fauce 7 mm longa 9 mm lata tubo extus inferne leviter breviterque cano-sericeo parte basilari extrema glabra 7 mm excepta intus glabro, fauce extus densius cano-sericea intus dense sericea, lobis 8 lineari-lanceolatis subfalcato-attenuatis apice obtusis vel subacutis 36–41 mm longis 3.5–5 mm latis utrinque breviter canotomentellis; staminibus 8, antheris lineari-oblongis 5.5 mm longis apice acumine lanceolato acuminato 0.2–0.5 mm longo basi obtuse subsagittatis; floribus femineis non visis; bacca non visa.

PERU. Dept. San Martín: Zepelacio, near Moyobamba; mountain forest; alt. 1200–1600 m; Dec 1933, *G. Klug 3452* (holotype NY).

This species is easily distinguished by the combination of puberulent to subhirtellous flowering branches, the puberulous lower surface of the leaf-blades, and corolla-lobes nearly as long as the corolla-tube in the staminate flowers. It ascends to a higher altitude than any of the other known species of the genus.

From *K. sericantha* Standl., with which it was mistaken by Standley, it is at once separated by the corolla-lobes of the staminate flower nearly equaling the corolla-tube, the more sparsely pubescent outer surface of the shorter corolla-tube, the glabrous outer surface of the calyx-tube, the smaller leaf-blades lacking a reticulate tertiary venation, the conspicuous indument on the lower surface of the leaf-blades, and apparent lack of resinous exudate on the branches or foliage.

7. **Kotchubaea urophylla** (Standl.) Steyermark, comb. nov.

Amaioua urophylla Standl. Field Mus. Bot. Ser. **8**: 354. 1931.

PERU. Dept. Loreto: Mishuyacu, near Iquitos; forest; alt. 100 m; Oct–Nov 1929, *G. Klug 419* (holotype F, isotypes NY, US).

This species is noteworthy in having the staminate flowers capitately clustered on elongated peduncles, 6-merous flowers, densely pubescent calyx and lower surface of the leaf-blades, abruptly long-caudate leaf-blades, and elongate anthers.

The species was originally placed by Standley in the genus *Amaioua*. However, the stipules, which are free and do not form a conical cap connate into a sheath, as in *Amaioua*, are persistent and characteristic of the genus *Kotchubaea*. From all other members of the genus, *K. urophylla* may be recognized by the 6-merous, capitate, subsessile to sessile flowers.

8. **Kotchubaea semisericea** Ducke, Arch. Inst. Biol. Veg. **2**: 71. 1935.

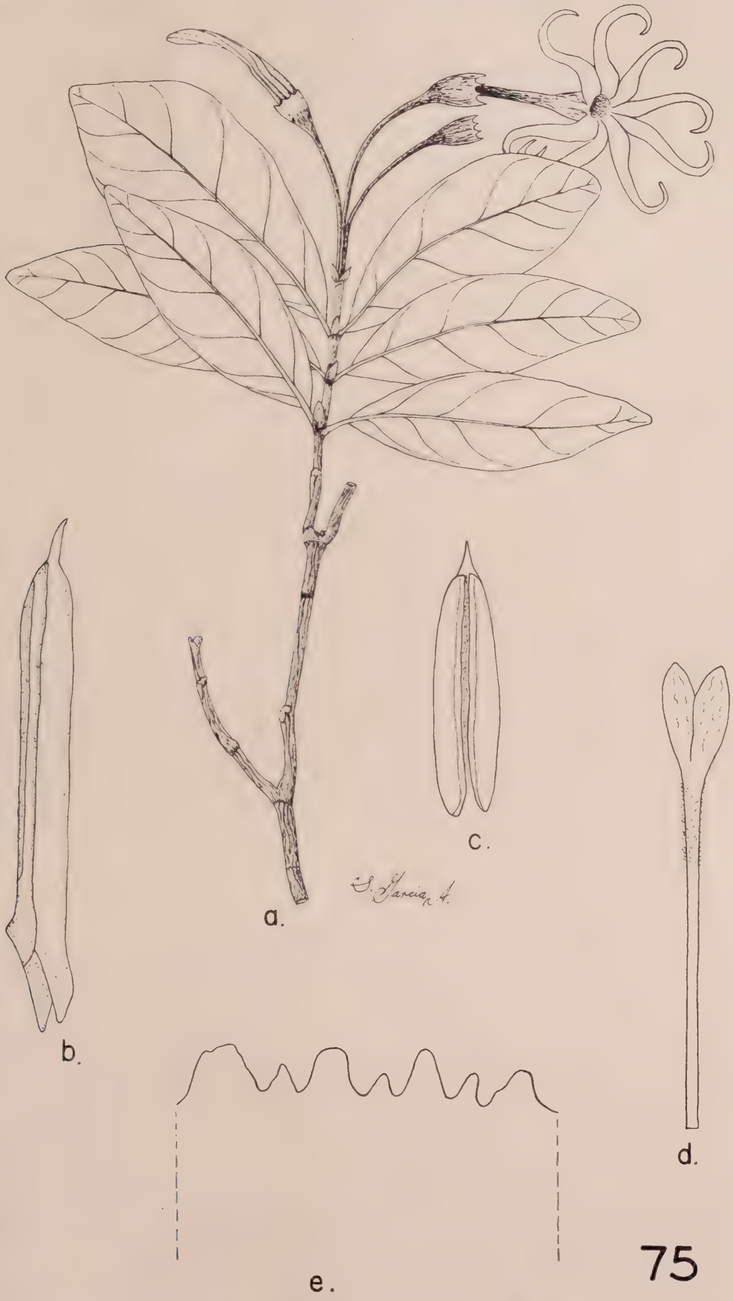
Distribution. Amazonian Brazil along Rio Solimões and near mouth of Rio Javary.

BRAZIL. Amazonas: Rio Solimões, São Paulo de Olivença; silva primaria loco alto; arbor vix mediocris; floribus albis odoratis; 31 Oct 1931, *A. Ducke 24009* (photo of isotype from P at F, isotypes F, US); near Palmares, basin of Rio Solimões, Municipality São Paulo de Olivença; terra firma, low land; tree 60 ft high, trunk 7 inch diam; 11 Sep–26 Oct 1936, *Krukoff 8372* (F, NY); Esperança, ad ostium fluminis Javary; silva inundabili secus rivulum; flores ochroleuci demum lutescentes, odorati; arbor parva; 26 Oct 1942, *Ducke 1134* (3 sheets, US, NY).

9. **Kotchubaea longiloba** Steyermark, sp. nov. Fig. 75.

Arbor dioica 15-metralis, ramulis glabris; stipulis persistentibus ovato-oblongis obtusis 5–7 mm longis 3–4 mm latis glabris marginibus ciliolatis exceptis; foliis adultis glabris petiolatis, petiolis 5–10 mm longis glabris; laminis subcoriaceis supra atroviridibus subtus pallidiori-viridibus oblongo-ellipticis vel obovatis apice obtusis vel rotundatis basi acutis 7–13 cm longis 2–6 cm latis glabris, nervis lateralibus utroque latere 4–5 subtus tenuissime prominulis; *floribus masculis* speciosis odoratis cymis paucifloris pedunculatis in umbellulam terminalem 2–3-floram compositis, pedicellis 2–7 cm longis erectis glabris; *calyce masculo* tubuloso 12–17 mm longo 7–10 mm lato extus glabro apice ciliolato excepto intus toto dense flavido cano-sericeo apice irregulariter dentato 4–5 dentibus majoribus triangularibus vel rhomboideis obtusis vel rotundatis 1.5–2 mm longis cum 4 minoribus deltoideis vel triangulari-ovatis rotundatis vel acutis alternantibus; *corolla mascula* hypocrateriformi, tubo pallido-viridi vel flavido 22–35 mm longo basi 5 mm diam superne ampliato fauce 8–10 mm longa 10–12 mm diam, tubo extus parte basilari 17 mm longa glabra parte apicali cano-puberulenti intus fauce dense flavido-villosa, lobis patenti-descendentibus luteis 8, lineari-lanceolatis longe acuminatis 45–50 mm longis 4–5 mm latis, utrinque cano-pulverulentibus; staminibus 8 vel 10 sessilibus, antheris anguste oblongis inaequalibus 5–7 mm longis apice acumine lanceolato acuminato 1 mm longo basi subsagittatis; stylo 3 cm longo inferne 2 cm longo glabro superne 1 cm longo breviter piloso; stigmatibus clavatis vel spatulato-oblongis 5–6 mm longis glabris; floribus femineis non visis; bacca non visa.

VENEZUELA. Edo. Bolívar: near Río Tirica, lower southwestern slopes of Chimantá-tepui (Torono-tepui), Chimantá Massif; rich forest, vicinity of Base Camp; alt. 1000 m; tree 50 ft tall; leaves subcoriaceous; corolla fragrant, lobes drooping, yellow; corolla-tube pale greenish to pale yellow; 24 May 1953, *Julian A. Steyermark 75544* (holotype VEN, isotypes F, NY).



75

FIG. 75. *Kotchubaea longiloba.* a, habit, × ½. b, anther lateral view, × 10. c, anther, ventral view, × 5. d, stigmas with style, × 2. e, hypanthium and calyx-tube, spread open to show calyx-lobes, × 2½.

This species differs from all the other known species of the genus in having the corolla-lobes longer than the corolla-tube.

10. **Kotchubaea insignis** Fisch. ex DC. Prodr. **4**: 373. 1830; Arch. Jard. Bot. Rio de Janeiro **4**: 186. *pl. 24.* 1925.

Patima ? laxiflora Benth. Jour. Bot. **3**: 220. 1841.

Distribution. Lowland, non-inundated forest, at low elevations near sea-level, Amazonian Brazil, French Guiana, and British Guiana.

FRENCH GUIANA. Without locality or date, *Leprieur* (?) *397* (photo and fragment of holotype from B at F, photo at NY, staminate flowers); without locality and date, ex herb. Copenhagen, *997* (F, staminate flower); without locality and late, *Leblond* (F, sterile); without locality, 1845, *Melinon* (F, NY, US, staminate flowers); Cayenne, without date, *M. Martin* (F, staminate flowers). BRAZIL. Amazonas: Belém, Utinga; silva non inundabili; pistillate arbor mediocris; floribus albidis demum lutescentibus, odoratis; 27 May 1943, *Ducke 1247* (NY, US, pistillate flowers); Belém do Pará, 9 Aug 1902, *R. Siqueira 2838* (US, fruiting); Belém do Pará, 29 May 1914, *Ducke 15332* [US, 2 sheets pistillate flower (US no. 1040636) and fruit (US no. 1040635)]; Belém do Pará, 29 May 1914, *Ducke 15331* (F, US, staminate flowers); Belém do Pará; silva humido ad urbem; arbor media; floribus albidis demum lutescentibus, odoratis; 18 May 1926, *Ducke 15540* (US, staminate flowers). Maranhâo: Capoeirao, Turyassú; baum 10–20 m; krone grünlichgelb; 16 Oct 1923, *E. H. Snethlage 273* (F, pistillate flowers).

The calyx together with the hypanthium in the pistillate flowers is more elongated than in the other species of *Kotchubaea* and attains a combined length up to 30 mm. In this species, likewise, the long peduncle of the pistillate flowers serves to distinguish this species from other known taxa of the genus. In most cases this peduncle in anthesis is 10–17 mm long, but in *Snethlage 273* it attains a length of 30 mm. Except for the *Snethlage 273* specimen, in which 3 apparently pistillate flowers terminate the flowering branch, all the other collections examined have a solitary terminal pistillate flower. The staminate and pistillate corollas are exceptional in the genus in having the outside surface of the corolla-tube glabrous throughout.

Maguireothamnus Steyermark, gen. nov.

Frutices non glutinosi, parce ramosi. Stipulae interpetiolares in vaginam connatae in acumen triangulari-subulatum prominens persistens contractae. Folia opposita ad apicem ramorum subconferta coriacea, subtus nervis lateralibus venulisque obsoletis. Flores speciosi magni in axillis supremis solitariis breviter pedicellati vel sessiles, bibracteati. Bracteae conspicuae foliosae. Calycis lobi aequales vel inaequales. Corolla speciosissima magna plerumque alba hypocrateriformis 5–6-lobata, tubo longissimo intus parte suprema tomentosa vel villosula aliter glabro, lobis contortis. Stamina 5 inclusa, antheris in parte suprema corollae insertis. Stylus saepe exsertus, parte suprema dense papillata. Ovarium biloculare. Ovuli plures. Capsula ab apice loculicidaliter dehiscens. Semina subalata subcompressa irregulariter subrhomboidea angulata testa foveolata.

Type species: *Maguireothamnus speciosus* (N. E. Brown) Steyermark.

This new genus is named in honor of Bassett Maguire, Head Curator, The

New York Botanical Garden. It is fitting that the name of such a spectacularly handsome shrub be associated with that of Maguire, who, by his numerous expeditions into the remote hinterlands of southern Venezuela, has succeeded in making available the mass of remarkable plant material existing there. The present genus is restricted to the table-mountains (tepuis) of Venezuela which Maguire has explored since 1944.

This genus is a member of the tribe Rondeletieae and is related by its loculicidally dehiscent capsules to the genera *Ucriana* Spreng., *Phitopis* Hook. f., *Macbrideinia* Standl., and *Sipanea* Aubl. The latter is a genus of herbaceous plants with short corollas resembling those of true *Chalepophyllum.* In the arboreal genus *Macbrideinia,* known from Peru, the stipules are large and caducous, the inflorescence is terminal and cymose-corymbose, the triangular calyx-lobes are deciduous, and the anthers are exserted. In the genera *Ucriana* and *Phitopis,* both of which are trees or shrubs, the deciduous stipules immediately distinguish them from *Maguireothamnus.* They are further distinguished by several other characters: in *Ucriana* the tube of the corolla is curved and the valves of the capsule are spirally twisted to the base, whereas in *Phitopis* the corolla is rather short and scarcely surpasses the unequally 2–3-lobed calyx.

The genus *Maguireothamnus,* as thus constituted, is a closely-knit, distinct one, with no closely related genera, geographically isolated on the slopes and summits of the table-mountains of southern Venezuela. The species range from Cerro Duida, Cerro Huachamacari, and Cerro Sipapo (Paraque) on the west to Ptari-tepui, Roraima, and Serra do Sol on the east, its eastern limits on Roraima extending to the British Guiana border and on Serra do Sol extending to the Brazilian frontier.

When N. E. Brown (Trans. Linn. Soc. Bot. II. **6**: 33. *pl. 5, figs. 10–17.* 1901) described *Chalepophyllum speciosum,* based on collections by Mc Connell & Quelch (*100, 305, 653*) from the summit of Mount Roraima in Venezuela, he assumed that his new species was congeneric with the *Chalepophyllum guianense* Hook. f. described in 1873. Although the *C. speciosum* N. E. Brown with its large showy corollas was an entirely different appearing plant from the small-flowered *C. guianense* Hook. f., later botanists placed additional species of the large corolla type under *Chalepophyllum.* Thus, Standley (Field Mus. Bot. Ser. **7**: 379–381. 1931) described *C. latifolium* and *C. tatei,* based on the Duida collections of Tate, and Gleason (Brittonia **3**: 192. 1939) described *C. coriaceum* from collections of Tate from the Auyan-tepui expedition. However, although Standley was certain that his *C. tatei* was congeneric with the other large-flowered *C. speciosum* N. E. Br., he was in doubt as to its congeneric status with *C. guianense,* stating (loc. cit. p. 381) "There is no doubt that *C. tatei* is congeneric with *C. speciosum,* but there is considerable doubt in the writer's mind regarding their relationship to *C. guyanense.* Their status cannot be resolved, however, without access to material of *C. guyanense,* and perhaps to better material than is afforded by the type specimens."

As a result of later expeditions by the present author and by Bassett Maguire and his colleagues, a large amount of material of this *Chalepophyllum* group has become available for study. Good fruiting material is amply represented in these collections. They show, without doubt, that the plants consecutively described as *Chalepophyllum speciosum, C. latifolium, C. tatei,* and *C. coriaceum,* all possess loculicidally dehiscent capsules. This is quite in contrast to the very definitely septicidally dehiscent capsules of the originally described *Chalepophyllum, C. guianense* Hook. f. from British Guiana, type species of the genus.

In describing his *Chalepophyllum speciosum* from Mount Roraima, N. E. Brown stated that no fruits were seen in the Mc Connell & Quelch specimens. Moreover, Standley had only flowering material of his *C. tatei* from Mount Duida. Although he described fruits and seeds of *C. latifolium*, Standley did not observe the loculicidal dehiscence of the capsule, which is present on the holotype specimen preserved (NY). At the time he described *C. coriaceum,* Gleason did not have access to mature or dehiscent fruit, thus no mention was made of the fruit, or of its mode of dehiscence.

A careful examination of the species described under *Chalepophyllum* by Brown, Standley, and Gleason, has revealed, in addition to the character of loculicidal type of dehiscence, other significant morphological characters, which furnish the basis for a new generic status for the plants of the Venezuelan table mountains heretofore passing as species of *Chalepophyllum*. These additional characters are discussed in the following paragraphs.

STIPULE: In true *Chalepophyllum*, represented by *C. guianense,* the stipule is inconspicuous, low, broadly triangular, and barely acute. In the later-described large-flowered Venezuelan taxa (*Maguireothamnus*), the stipules are connate into a sheath which is contracted into a prominent persistent triangular-subulate free portion 2–6 mm long.

BRACT: In true *Chalepophyllum,* represented by *C. guianense,* the base of the pedicel is subtended by two minute ovate bracts barely 1 mm long. In the taxa now segregated as *Maguireothamnus* the two bracts at the base of the flower are conspicuous and foliose, varying from 7–16 mm long.

STYLE: In true *Chalepophyllum* the style is glabrous throughout. In *Maguireothamnus* the uppermost portion of the style is densely covered by white papillae.

COROLLA: LENGTH: In true *Chalepophyllum* the corolla is quite small, the corolla-tube varying from 1–1.6 cm long, the lobes 0.6–1.5 cm long. In contrast, in *Maguireothamnus* the corolla is large and showy, the elongated tube mainly 5–12 (rarely 4) cm long, and the lobes mainly 2–5 cm (rarely 1.5) long.

COROLLA: BEARDING AT ORIFICE: In true *Chalepophyllum* the orifice of the corolla is thickly bearded with elongated multicellular hairs up to 2 mm long. These protrude from the orifice and extend as well up to the base of the corolla-lobes, the bearding thus showing prominently in herbarium material. In *Maguireothamnus* the hairs are short, inconspicuous, do not extend to the base of the corolla-lobes, nor protrude at the orifice, so that in herbarium material the orifice appears naked.

LEAVES: In true *Chalepophyllum* the lower surface of the leaf-blades has all the veins prominently elevated and tomentulose into a characteristic tessellated, rugulose, areolate surface, and the lateral nerves are prominent. In contrast, the taxa of *Maguireothamnus* have smooth and veinless lower surfaces of the leaf-blades, or, if pubescent, the hairs are simply dispersed, and the lateral nerves are absent or obsolete.

GLUTINOUS EXUDATE: In true *Chalepophyllum* a glutinous or sticky exudate appears in the uppermost parts of the branches, usually at the base of the petioles or at the base of the pedicels or peduncles. In *Maguireothamnus* no exudate is present.

Other minor differences which may be pointed out are as follows:

EXSERTION OF STYLE: In true *Chalepophyllum* the style may be included within the corolla-tube or at most only slightly exserted to about 2 mm beyond the orifice of the corolla. In contrast, in *Maguireothamnus* the style is usually prominently exserted a distance of often 10–17 mm beyond the orifice.

ANTHERS: In *Maguireothamnus* the anthers are located in the uppermost part of the corolla-tube near its orifice, whereas in true *Chalepophyllum* the anthers are located about ½–¾ way up the corolla-tube.

INFLORESCENCE: In *Maguireothamnus* the flowers are solitary in the upper axils and shortly pedicellate or subsessile. In true *Chalepophyllum* the flowers may be solitary and shortly pedicellate or occur as 2–4 cymosely arranged at the tip of elongated peduncles which may reach 6 cm in length.

These essential differences may be summarized as follows:

Capsule loculicidally dehiscent; stipule persistent, terminating in a prominent triangular-subulate free portion 2–6 mm long; lateral nerves and veins absent or obsolete on lower surface of leaves; bracts subtending flower conspicuous, foliose, 7–16 mm long; upper part of style densely papillate; corolla showy, very large, the tube mainly 5–12 (rarely 4) cm long; corolla lobes chiefly 2–5 (rarely 1.5) cm long; corolla-tube not densely long-bearded within at orifice, the tomentum not attaining the summit or evident on herbarium material; no glutinous exudate present on stems, leaves, or inflorescence. *Maguireothamnus.*

Capsule septicidally dehiscent; stipule often deciduous, inconspicuous, broadly triangular, and subacute; lateral nerves and veins prominent on lower surface of leaves, the veins elevated to form a tessellated, rugulose, areolate surface finely tomentulose; bracts subtending flower inconspicuous, scarcely 1 mm long; style glabrous; corolla relatively small, the tube 1–1.6 cm long; corolla-lobes 0.6–1.5 cm long; corolla-tube densely bearded at orifice with elongated hairs up to 2 mm long and extending beyond the orifice and evident in herbarium material; glutinous exudate present on some part of petiole, stem, or base of inflorescence. *Chalepophyllum.*

Key to the Species of *Maguireothamnus*

Ovary (hypanthium) and capsule glabrous; calyx-lobes glabrous; mature capsule 20–25 mm long; seeds 4–5 mm long; plants of the eastern sandstone table mountains of Venezuela in the state of Bolívar west to Auyan-tepui. 1. *M. speciosus.*

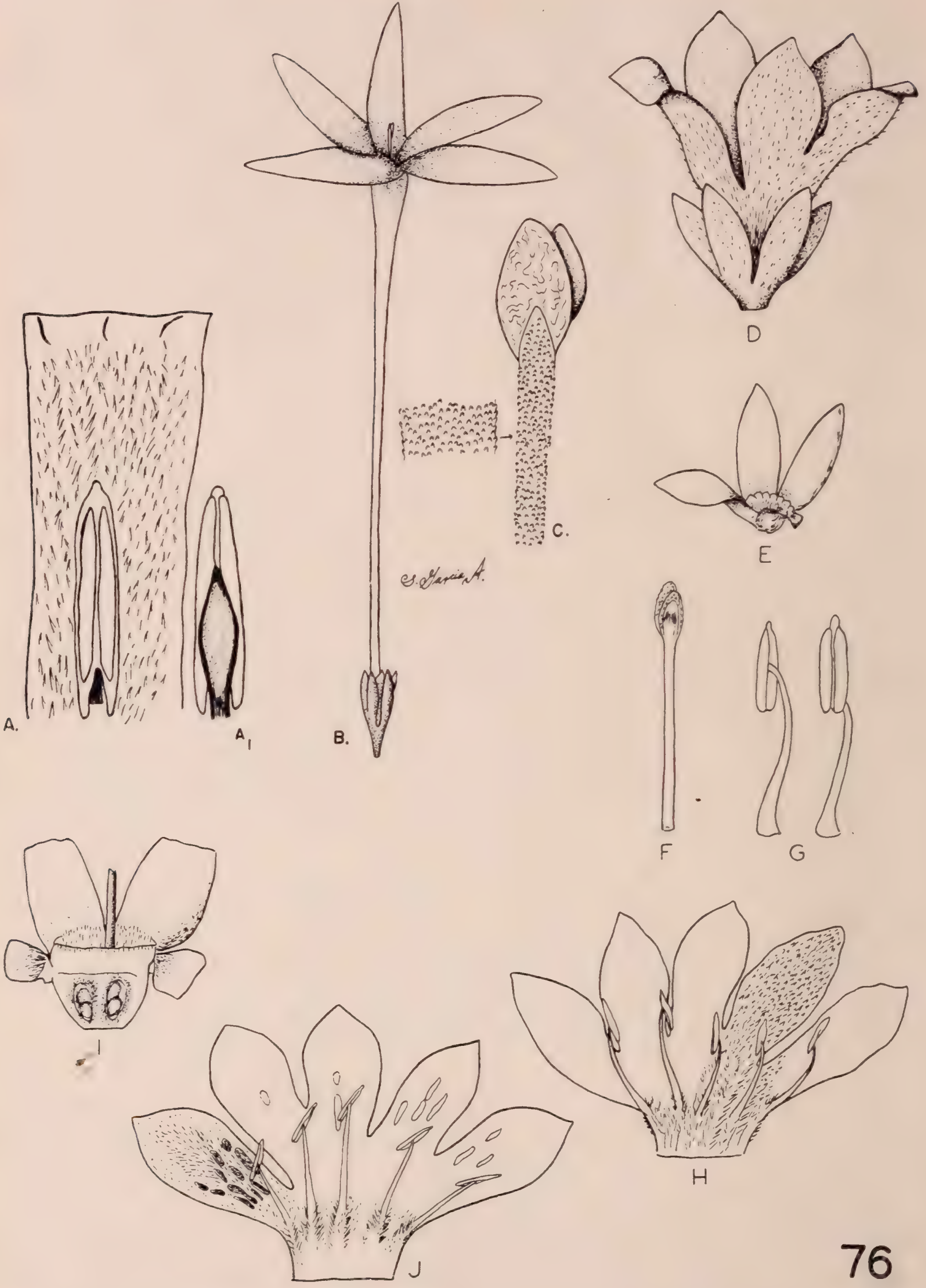
Ovary (hypanthium) and capsule densely hispidulous; calyx-lobes sparsely to moderately hispidulous-ciliolate; mature capsule 13–15 mm long; seeds 2.5–3 mm long; plants of the western sandstone table mountains of Venezuela in Territorio Federal Amazonas. 2. *M. tatei.*

1. **Maguireothamnus speciosus** (N. E. Br.) Steyermark, comb. nov. Fig. 76, A–C.

Chalepophyllum speciosum N. E. Brown, Trans. Linn. Soc. II. **6**: 33. *pl. 5, fig. 10–17.* 1901; Standley, Field Mus. Bot. Ser. **7**: 381. 1931.
Chalepophyllum coriaceum Gleason, Brittonia **3**: 192. 1939.

Distribution. Slopes and summits of sandstone table mountains of Venezuela from Mount Roraima and Serra do Sol on the east by the British Guiana and Venezuelan frontiers respectively west to Auyan-tepui, in estado Bolívar. This is the most widely distributed species of the genus.

VENEZUELA. Bolívar: summit, Roraima; alt. 8600 ft; autumn 1898, *Mc Connell & Quelch 653* (photo of holotype of *Chalepophyllum speciosum,* from K at NY); summit, Mount Roraima; flower large, buffy-white, with red outside



76

FIG. 76. A–C, *Maguireothamnus speciosus.* A, segment of uppermost portion of corolla-tube showing position of one stamen, base of corolla-lobe, and orifice, semi-diagrammatic, × 4. A_1, anther, dorsal view, × 4. B, corolla and calyx, × 0.5. C, upper part of style and stigmas, showing papillate surface of style, × 6; more highly magnified portion of style shown at left. D–H, *Platycarpum decipiens.* D, corolla and calyx, × 1.5. E, vertical section through ovary, showing connection with calyx-tube, with two calyx-lobes removed, × 1.5. F, style and stigmas,

the involutions; leaves oval, stiff, opposite; 24 Nov 1927, *Tate 388* (NY); summit of Mount Roraima; corolla with spreading-recurving lobes, white within, without white with deep rose-red on one margin; corolla-tube pale green; flowers very fragrant; leaves coriaceous, shining and deep green above, margined brick or dull reddish; corolla lobes in bud reddish; 27 Sep 1944, *Steyermark 58860* (F, NY, VEN); Ptari-tepui; *Bonnetia roraimae* forest on southwest-facing shoulder; alt. 2000–2200 m; shrub 3 ft tall; flowers sweet-fragrant; corolla-tube pale brick, lobes white; 2 Nov 1944, *Steyermark 59740* (F, NY); Ptari-tepui; south-facing forested slopes vicinity of "Cave Rock"; alt. 1800–1900 m; 2 Nov 1944, *Steyermark 59801* (NY, VEN); summit of Serra do Sol; occasional; alt. 2300 m; shrub 1–1.5 m tall; petals white, rose-margined; 28 Dec 1954, *B. Maguire & C. K. Maguire 40392* (NY); Mount Auyan-tepui; alt. 2200 m; Dec 1937, *Tate 1179* (holotype of *Chalepophyllum coriaceum* NY, isotype VEN); Chimantá Massif, headwaters of Río Tirica; frequent; rocky and swampy savanna; alt. 2120–2210 m; depressed shrub 1 m tall; 11 Feb 1955, *Steyermark & Wurdack 743* (F, NY, VEN); Chimantá Massif, vicinity of Summit Camp along Río Tirica; frequent; alt. 1925 m; 20 Feb 1955, *Steyermark & Wurdack 1004* (F, NY, VEN); Chimantá Massif, Apacará-tepui; swampy savanna; alt. 2000–2100 m; 20 Jun 1953, *Steyermark 75781* (F, NY, VEN); Chimantá Massif, Abácapa-tepui; *Bonnetia* forest; alt. 2125–2300 m; 13 Apr 1953, *Steyermark 74881* (F, NY, VEN); Auyan-tepui; alt. 2300 m; Apr 1956, *Vareschi & Foldats 4858* (VEN); Auyan-tepui; dominante en la formación arbustiva; alt. 1900 m; Apr 1956, *Foldats 2603* (VEN); Auyan-tepui; alt. 2100 m; Enero 1949, *Cardona 2669* (VEN); Chimantá Massif, northwest cumbres, Churi-tepui (Muru-tepui); occasional; alt. 2250–2300 m; 26 Jan 1953, *Wurdack 34209* (NY); Chimantá Massif, lower part of lower cumbre, Churi-tepui (Muru-tepui); alt. 2100–2200 m; 24 Jan 1953, *Wurdack 34178* (NY).

At the time Gleason described *Chalepophyllum coriaceum* (Brittonia **3**: 192. 1939), he contrasted it with *C. speciosum* N. E. Brown of Mount Roraima. Gleason attempted to differentiate *C. coriaceum* on the basis of its longer internodes, shorter erect-appressed prolongation of the stipule, leaf-blades more cuneately narrowed at the base, and broader corolla-lobes less attenuate at the apex. These differences do not hold, however, as evidenced by an examination of all available material.

In his original description of *Chalepophyllum speciosum* N. E. Brown states that the leaves are "cuneate at the base" (Trans. Linn. Soc. II. **6**: 33. *pl. 5, fig. 10–17.* 1901). This condition may be largely observed in the original plate accompanying the description as well as in the photograph of the holotype collection by *Mc Connell & Quelch* from the summit of Mount Roraima (NY). However, there is considerable variation in the character of the leaf-base, even in topotypical material. For example, *Tate 388*, a topotype from the summit of Roraima, has the base of the leaf-blades obtuse to obtusish, while *Steyermark 58860*, also a topotype, has a cuneate leaf-base on one of the sheets at NY, but a duplicate specimen at VEN and on another sheet at NY shows the leaf-base obtuse or obtusish. There appears to be no fundamental difference between the cuneate-based leaves of the Roraima *C. speciosum* and those of the Auyan-tepui *C. coriaceum*. Both taxa show overlapping variations in shape and apex of the leaves.

Similarly, with respect to variation in length of internode and prolongation

---

× 3. G, stamen in dorsal and ventral positions, × 3. H, corolla spread open, × 1.5. I–J, *Platycarpum maguirei*. I, vertical section through ovary, showing attachment of calyx-tube, with part of calyx and calyx-lobes removed, × 3.5. J, corolla spread open, × 1.5.

of stipule, no correlation can be found in these characters between the plants of Roraima (where *Chalepophyllum speciosum* was described) and those of Auyan-tepui (where *Chalepophyllum coriaceum* was described), or in those plants collected on Ptari-tepui, Chimantá Massif, and Serra do Sol. Gleason described his *C. coriaceum* as having the acumen of the stipules "erect, appressed" and "2–4 long" with internodes "mostly 1.5–3 cm long" (loc. cit. p. 192), contrasting this with *C. speciosum* which, according to him, had stipules "much longer and more or less spreading" and internodes "only 1–10 mm long." Unfortunately, these differences, likewise, do not hold, variations in internode length and stipule length occurring on the same plants. Where the specimen has been collected from elongated vegetative shoots or from a portion of the main thicker branch, the internodes show, for the most part, greater lengths than those of the short lateral and upper terminal shoots. There is as much crowding of the internodes on flowering and fruiting branches of plants from Roraima (type locality of *Chalepophyllum speciosum*) as from those of Auyan-tepui (type locality of *C. coriaceum*). In the original plate illustrating *C. speciosum* the internodes are shown varying from short and crowded (4–5 mm long) on the branch at the lower side of the reproduction to longer (8–11 mm long) on the branch at the right side of the same illustration. All degrees of variation are exhibited on collections from Chimantá Massif, the collections of *Steyermark & Wurdack 1004* having prolongations of the stipules 2–2.5 mm long, while *Steyermark 75781* has stipule prolongations of 5–6 mm long on elongated vegetative shoots. Topotype material of *C. speciosum* from Roraima (represented by *Tate 388, Steyermark 58860,* and *Mc Connell & Quelch 653*) shows internodes from 3–8 mm long and stipule tips from 3–5 mm long, whereas holotype and topotype material of *C. coriaceum* from Auyan-tepui (represented by *Tate 1179, Cardona 2669, Foldats 2603,* and *Vareschi & Foldats 4858*) has internodes ranging from 3–20 mm long and stipule tips from 2–4 mm long. Collections from Chimantá Massif have internodes ranging from 3–14 mm long and stipule tips from 2–6 mm. Collections from Ptari-tepui have internodes 3–5 mm long (*Steyermark 59740*) to 10–15 mm long (*Steyermark 59801*) and stipule tips from 2–3.5 mm long.

As regards length of corolla-tube and length and shape of corolla-lobes, great variation is encountered. On topotypical material from Mount Roraima of *Chalepophyllum speciosum* the corolla-tube varies from 45–90 mm long, the corolla-lobes from 25–50 mm long and mainly 7–12 mm broad (4 mm in dried wrinkled material), while in topotypical material from Auyan-tepui of *C. coriaceum* the corolla-tube varies from 70–100 mm long, the corolla-lobes from 20–36 mm long and 7–12 mm broad. Specimens from Chimantá Massif range from corolla-tube lengths of 65–115 mm long and corolla-lobes 25–48 mm long and 7–15 mm broad. From Ptari-tepui the length of the corolla-tube measures 85–90 mm long, the corolla-lobes 35 mm long by 7–8 mm broad. Specimens from Serra do Sol (*Maguire & Maguire 40392*) show the greatest extremes in width of corolla-lobes, these having a width of 14–19 mm. The length of 40–47 mm in this latter collection is matched by a *Wurdack 34209* collection from Chimantá Massif having corolla-lobes 42–48 mm long but a width of 9–11 mm. There is too much intergradation in corolla-lobe width to segregate the Serra do Sol collection. So far as corolla-lobe width, there are overlapping and non-correlating variations in width among the range of material passing as *Chalepophyllum speciosum* and *C. coriaceum*. Also, in many specimens the corolla-lobes are not pressed equally flat, resulting in some shrinkage with measurements of width less than in well-pressed or living material.

Gleason believed that the plants of his *C. coriaceum* had more broadly acute and less narrowly pointed tips to the corolla-lobes than the narrower, more attenuate apices found in the Roraima material of *C. speciosum,* but later topotype collections of *C. coriaceum* from Auyan-tepui (*Cardona 2669*) and of the nearby Chimantá Massif show as narrow corolla-lobes with as attenuate apices as those of *C. speciosum.* Moreover, other collections from Chimantá show various degrees of corolla-lobe width and apex attenuation.

Most of the stipules and their prolongations are completely glabrous throughout. A collection from Ptari-tepui (*Steyermark 59740*) has stipules strigose on the upper margins and linear-cuspidate prolongations of the apex, but from the same table mountain another collection (*Steyermark 59801*) varies from stipules completely glabrous to strigose on the tips and upper margins on the branch on the left hand side of the sheet in the Herbario Nacional of Venezuela. A topotype of *C. speciosum* from Mount Roraima (*Tate 388*) also shows the stipule prolongation and upper margins sparsely strigose, while other collections from Roraima (*Steyermark 58860*) exhibit both glabrous and sparsely strigose conditions.

2. **Maguireothamnus tatei** (Standl.) Steyermark, comb. nov.

Chalepophyllum tatei Standl. Field Mus. Bot. Ser. **7**: 380. 1931.

This taxon varies principally in shape, base, and apex of leaf-blade. Two variations may be recognized.

Key to the Varieties of *Maguireothamnus tatei*

Leaves cuneate or more or less narrowed at base, acute to acutish at apex, elliptic-oblong to lance-elliptic, 2¾–5 times as long as broad. 2a. *M. tatei* var. *tatei.*
Leaves rounded or broadly obtuse at base, obtuse to somewhat rounded at apex, oval to broadly oblong, 1½–2½ times as long as broad. 2b. *M. tatei* var. *latifolius.*

2a. **Maguireothamnus tatei** (Standl.) Steyerm. var. **tatei**

Chalepophyllum tatei Standl. Field Mus. Bot. Ser. **7**: 380. 1931.

Distribution. Upper escarpments and summits of the sandstone table mountains of Venezuela along the western axis of the table mountains in Territorio Federal Amazonas from Cerro Sipapo (Paráque) south to Cerro Huahamacari.

VENEZUELA. Amazonas: Mount Duida, summit of Peak no. 7; alt. 2130 m; Aug 1928–Apr 1929, *G. H. H. Tate 623* (holotype of *Chalepophyllum tatei,* NY); Mount Duida, summit, slopes of ridge 25; alt. 1650–1800 m; 4 ft high; 26 Nov–16 Dec 1928, *Tate 427* (paratype of *Chalepophyllum tatei,* NY); Mount Duida, summit; alt. 1650–1800 m; Aug 1928–Apr 1929, *Tate 1016* (paratype of *Chalepophyllum tatei,* NY); Cerro Duida, southeastern-facing slopes along Caño Negro (tributary of Caño Iguapo); moist exposed cliff-face with *Brocchinia tatei;* alt. 1515 m; shrub 2–3 ft tall with erect rigid stems; flowers very fragrant, white on lobes, buff-greenish on tube; leaves coriaceous, deep green above; 25–26 Aug 1944, *Steyermark 58030* (F, NY, VEN); Cerro Duida, summit; high moist ridge top; alt. 1820–2075 m; 4 Sep 1944, *Steyermark 58335* (F, NY); Cerro Huachamacari, Río Cunucunuma; frequent on summit of East Ridge; alt. 1820 m; wandlike shrub to 1.5 m high; flowers white; 8 Dec 1950, *Maguire, Cowan, & Wurdack 30058* (NY); Cerro Huachamacari, Río Cunucunuma; frequent in cumbre; alt. 1700 m; 4 Dec 1950, *Maguire, Cowan, & Wurdack 29810* (NY); Cerro Huachamacari. Río Cunucunuma; between Summit Camp and East Escarpment;

alt. 1800–1950 m; 16 Dec 1950, *Maguire, Cowan, & Wurdack 30263* (NY); Cerro Huachamacari, southeast escarpment; common in marshy scrub savanna; alt. 1900 m; 11 Dec 1950, *Maguire, Cowan, & Wurdack 30142* (NY); Cerro Huachamacari, Río Cunucunuma; common on East Ridge; alt. 1800 m; shrub to 1 m; fruit reddish; 11 Dec 1950, *Maguire, Cowan, & Wurdack 30129* (NY); Cerro Sipapo (Paráque); frequent near Camp Savanna; alt. 1500 m; 6 Dec 1948, *Maguire & Politi 27541* (NY); Cerro Sipapo (Paráque); 25 Jan 1949, *Maguire & Politi 28582* (NY); Cerro Sipapo (Paráque); frequent near Camp Savanna; alt. 1500 m; 19 Jan 1949, *Maguire & Politi 28449* (NY); Cerro Sipapo (Paráque); between Savanna Camp and West Peak; alt. 1500–1800 m; 20 Dec 1948, *Maguire & Politi 27801* (NY); Cerro Paráque; alt. 1600 m; Feb 1946, *K. Phelps 11* (VEN); same locality and date, *K. Phelps 28* (VEN).

In *Maguireothamnus tatei* var. *tatei* the leaves are more cuneate and narrowed at the base and often more revolute than in var. *latifolius*. The leaf-blades are also generally narrower. Despite the fact that *Chalepophyllum tatei* was published on one page (p. 380) later than *C. latifolium* (p. 379), the present rules of International Nomenclature do not require strict page priority and permit the botanist to select the name for one taxon of a particular group, provided those names are published simultaneously, as in the present case. Since the variation represented by *M. tatei* var. *tatei* is the commoner and more prevalent type, and, therefore, biologically more widespread variation of the group, I have selected *M. tatei* as the nomenclatural as well as the taxonomic type of the group to which *M. tatei* belongs.

The plants of Cerro Duida and Cerro Huachamacari in general have leaf-blades which are more revolute, narrower, and often more narrowed at the base, with a lance-elliptic to elliptic-oblong shape, and 3.5–9 mm broad. This is somewhat in contrast to the plants of Cerro Sipapo (Paráque) in which the leaf-blades are plane to only slightly revolute, averaging broader, elliptic-oblong to oblanceolate-oblong, and 7–17 mm broad. However, these variations merge into one another imperceptibly, with resulting intergradation and non-correlation. Although the tendency to broader, less revolute leaves is shown by the Cerro Sipapo material, it is believed justifiable to allow the variation to exist as such under *M. tatei* var. *tatei*.

2b. Maguireothamnus tatei var. **latifolius** (Standl.) Steyermark, comb. nov.

Chalepophyllum latifolium Standl. Field Mus. Bot. Ser. **7**: 379. 1931.

Distribution. Summit of Cerro Duida, Territorio Federal Amazonas, southwestern Venezuela.

VENEZUELA. Amazonas: Mount Duida, summit; moist slopes of Savanna Hills; alt. 1330 m; bush; Aug 1928–April 1929, *G. H. H. Tate 730* (holotype of *Chalepophyllum latifolium*, NY); Cerro Duida, summit; Savanna Hills; alt. 1025–1200 m; shrub 5 ft tall; leaves subcoriaceous, deep green above, pale green below; corolla white, fragrant; 2 Sep 1944, *Steyermark 58240* (F, NY, VEN); Cerro Duida, Río Cunucunuma; open scrub on north slopes and ridges of Caño Negro basin; alt. 2000–2300 m; wandlike shrub 1–1.5 m; leaves coriaceous; 23 Nov 1950, *Maguire, Cowan, & Wurdack 29695* (NY).

This taxon represents the broadest-leaved variation of the *M. tatei* group. However, some of the broader-leaved variations found on Cerro Sipapo (Paráque) approach it both in leaf-shape and width. With respect to characters of the stipules, calyx, corolla, fruit, and seeds, this broad-leaved taxon cannot be dis-

tinguished from *M. tatei* var. *tatei*. Because it represents the variation of greater rarity and more restricted distribution, I have indicated it as a variety under *M. tatei*, despite the publication of the latter name on one page later, as explained in the discussion under *M. tatei* var. *tatei*.

Neblinathamnus Steyermark, gen. nov.

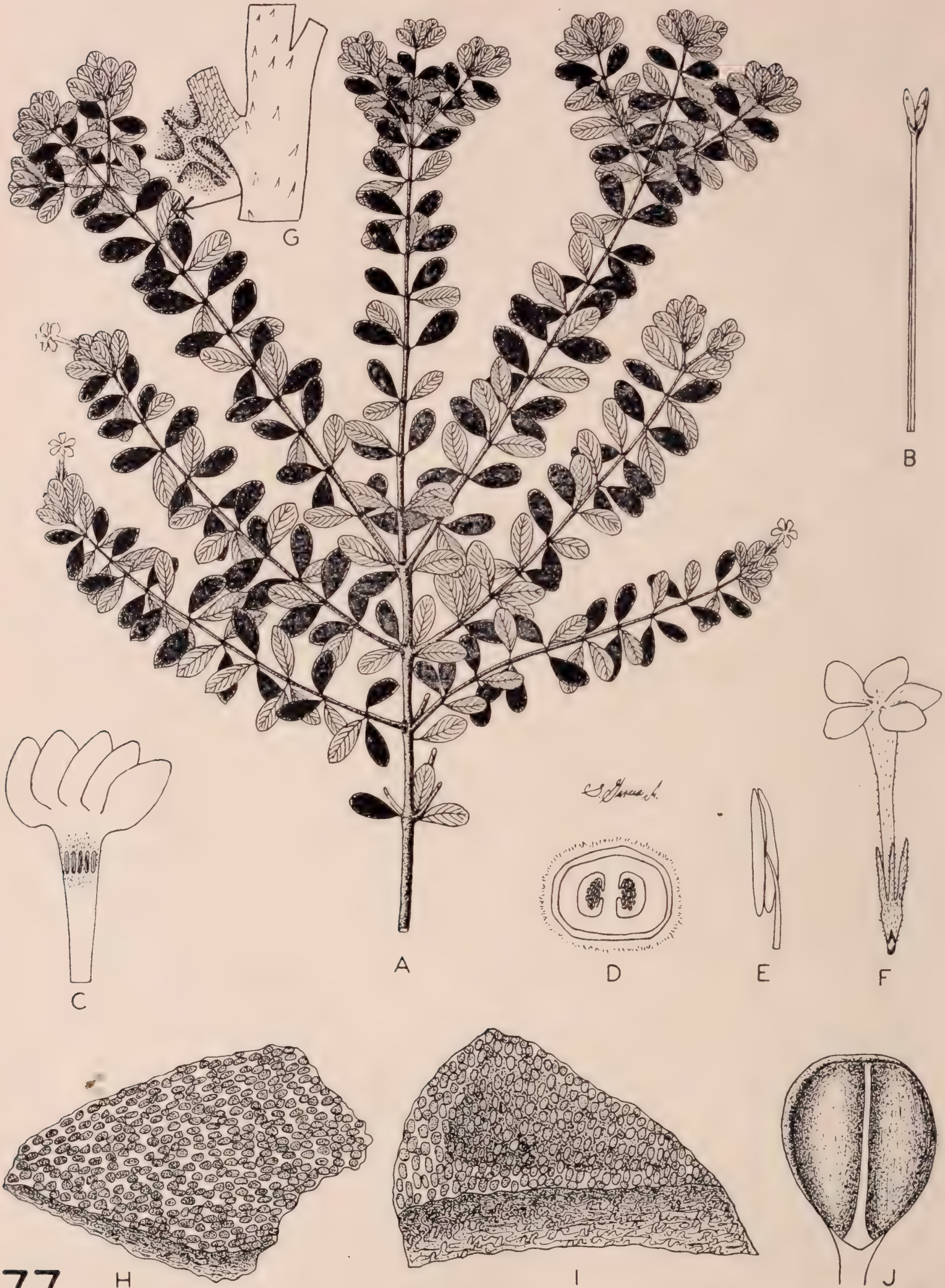
Frutices erecti, stipulis obsoletis caducis. Folia 3-verticillata subtus tessellata. Flores solitarii vel gemini terminales vel in axillis supremis pedicellati bracteolati, bracteolis duabus setaceis. Calyx 5-laciniatus, laciniis aequalibus vel inaequalibus linearibus vel spatulatis. Corolla hypocraterimorpha, tubo gracili, lobis 5 contortis. Stamina 5, filamentis supra medium tubi corollae insertis, antheris linearibus ad medium dorsifixis. Ovarium biloculare, ovulis numerosissimis. Discus crassus ovarium coronatus. Capsula loculicidaliter dehiscens. Semina parva angulata, testa rugoso-reticulata.

Type species: *Neblinathamnus argyreus* Steyerm.

This new genus is a member of the tribe Rondeletiae. It is related to *Sipanea*, differing from that genus in its woody habit and caducous or obsolete stipules. It is also related to *Dendrosipanea* and *Chalepophyllum*. From *Dendrosipanea* it may be distinguished by the loculicidal instead of septicidal dehiscence of the capsule, by the caducous or obsolete stipules, by the tessellate lower leaf-surface, and by the solitary or paired flowers. From *Chalepophyllum* it may be separated by the loculicidal instead of septicidal dehiscence of the capsule, the angled, non-alate, non-compressed seeds, and by the solitary or paired terminal or subterminal flowers.

Neblinathamnus argyreus Steyermark, sp. nov. Fig. 77.

Frutex 0.3–2 m altus, ramulis novellis angulatis hispidulo-hirtellis; stipulis obsoletis vel caducis, basi petioli intus pilis erectis setosis albidis instructis; foliis 3-verticillatis petiolatis, petiolis 2.5–3 mm longis hispidulis; laminis coriaceis supra atroviridibus subtus argenteis vel albidis, obovatis vel oblongo-obovatis apice rotundatis interdum mucronulatis basin versus cuneatim angustatis 10–19 mm longis 5–10 mm latis, supra rugulosis glabris subtus tessellatis areolis foveolatis papillis vermiformibus creberrimis instructis, areolarum marginibus hispidulo-ciliatis, costa media supra sulcata subtus adpresso-hispidula, nervis lateralibus utroque latere 5–7 supra sulcatis prominentibus nervis tertiariis laxe reticulatis; floribus solitariis vel geminis, pedicellis in anthesi 1.5–2.5 mm longis hispidulo-hirtellis in fructu ad 4 mm longis; bracteolis 2 setaceis 1 mm longis 0.1–0.2 mm latis hispidulis; hypanthio 2 mm longo 2 mm lato hirtello, calycis laciniis erectis linearibus vel lineari-spatulatis 4–7 mm longis 0.5–0.75 mm latis parce vel moderatim hirtellis; corolla hypocrateriformi 20–22 mm longa, tubo viridi vel flavido-viridi (teste *Maguire, Wurdack, & Bunting*) gracili 15–16 mm longo in parte inferiori tertia 1.5 mm lato fauce 3 mm lata extus parce hirtello intus in parte superiore 3 mm longo puberulenti, lobis 5, viridibus vel flavido-viridibus (teste *Maguire, Wurdack, & Maguire*) ovatis obtusis 5.5–6 mm longis 4.5–5 mm latis; antheris 5, linearibus 2.5 mm longis; filamentis 1.5 mm longis glabris; stylo filiformi 14.5–15 mm longo glabro; stigmatibus lanceolato-oblongis 1.5 mm longis; capsulis maturis subturbinatis apice truncatis 4–5 mm longis 3.5–4 mm latis extus dense hirtellis; seminibus maturis ferrugineo-fulvis angulatis oblongo-ellipticis 1–1.5 mm longis rugoso-reticulatis.



77

FIG. 77. *Neblinathamnus argyreus.* A, habit, × 0.5. B, style and stigmas, × 10. C, corolla, spread open, × 1.5. D, ovary, transverse section, × 10. E, stamen, × 7.5. F, corolla and calyx in position, × 1.5. G, segment of lower surface of leaf blade showing portion of midrib, base of lateral nerve, and depressed tessellate areas with cellular network, highly magnified. H, I, seeds viewed from above and laterally, respectively, × 50. J, capsule, exterior lateral view, × 5.5.

VENEZUELA. Amazonas: Cerro de la Neblina; frequent, trail escarpment; alt. 1800–1900 m; shrub to 2 m; corolla greenish; 16 Nov 1957, *B. Maguire, Wurdack, Keith, & C. K. Maguire 42120* (holotype NY); Cerro de la Neblina; escarpment edge above Cañon Grande east of Cumbre Camp; locally abundant; alt. 1800 m; shrub 0.3–1 m; flowers yellow-green; 22 Nov 1957, *B. Maguire, Wurdack, Keith, & C. K. Maguire 42171* (paratype NY); Cerro de la Neblina; frequent in open areas 6–8 km north of Cumbre Camp; alt. 1800–1900 m; 10 Jan 1954, *Maguire, Wurdack, & Bunting 37175* (paratype NY); Cerro de la Neblina; uppermost escarpment slopes south of Camp 3; alt. 1700 m; 27 Dec 1953, *Maguire, Wurdack, & Bunting 36960* (paratype NY); Cerro de la Neblina; occasional along west escarpment edge, summit; alt. 1700–2000 m; 30 Dec 1953, *Maguire, Wurdack, & Bunting 37011-A* (NY).

Neblinathamnus glabratus Steyermark, sp. nov.

Frutex, ramulis novellis dense hispidulis; foliis 3-verticillatis petiolatis, petiolis 2–3 mm longis hispidulis; laminis coriaceis revolutis anguste oblongis vel lineari-oblongis apice rotundatis basin versus cuneatim angustatis 13–33 mm longis 5–11 mm latis, supra glabris subtus tessellatis areolis foveolatis pallido-viridibus fere glabris papillis albidis paucis instructis, costa media supra sulcata subtus adpresso-hispidula, nervis lateralibus utroque latere 5–6 supra sulcatis subtus impressis adpresso-hispidulis; floribus in axillis superioribus geminis, pedicellis 2–4 mm longis dense hirtellis; hypanthio oblongo-obovoideo 2–2.5 mm longo 1.75–2 mm lato extus dense hirtello, calycis laciniis lineari-lanceolatis acutis 6–7 mm longis 0.7–1 mm latis hispidulo-ciliolatis aliter glabris; corolla hypocrateriformi 21 mm longa, tubo rubro (teste *Maguire, Wurdack, & Bunting*) gracili 14–15 mm longo in parte inferiore tertia 1.75–2 mm lato fauce 3 mm lata extus glabro intus in parte superiore 3 mm longa pubescenti aliter glabro, lobis 5 viridi-luteis (teste *Maguire, Wurdack, & Bunting*) late ovato-oblongis apice rotundatis 6 mm longis 5 mm latis; antheris 5 linearibus 2.25–2.5 mm longis 0.2 mm latis; filamentis 1–1.5 mm longis glabris; stylo filiformi 13 mm longo glabro; stigmatibus oblanceolato-oblongis 2 mm longis; capsulis 4.5–5 mm longis 4 mm latis extus hispidulis.

VENEZUELA. Amazonas: Cerro de la Neblina, summit; occasional along west escarpment edge; alt. 1700–2000 m; shrub; corolla-lobes lime-yellow; tube red; fruit red with green hypanthium; 30 Dec 1953, *Maguire, Wurdack, & Bunting 37011* in part (holotype NY).

The holotype collection was mixed with a portion of the other taxon described above. It differs from *N. argyreus* in having the corolla-tube completely glabrous externally, in the narrowly oblong or linear-oblong elongate leaf-blades whose lower pale green surface lacks the whitened masses of short hairs characteristic of *N. argyreus,* instead the depressed areoles are covered with a cellular reticulation, in the more prominently hispidulous surface of nerves, midrib, and veinlets of the lower leaf surface, and in the corolla color, which is greenish to greenish-yellow in *N. argyreus,* whereas in *N. glabratus* the corolla-tube is red and the corolla-lobes are "lime-yellow." The flowers of *N. glabratus* occur in pairs at the summit or uppermost axils of the shoots, whereas in *N. argyreus* the flowers are predominantly solitary, although also occurring in pairs.

That there are pronounced differences between *N. argyreus* and *N. glabratus* is apparent. Although it is quite possible that additional collections may break down the differences which appear to exist on the basis of the present material at hand, it is also evident that the differences now manifested can best be expressed as specific taxa.

Perama Aubl. Pl. Guian. **1**: 54. *t. 18.* 1775.

This is a genus of annual or perennial, mainly small, herbaceous plants of wide distribution in the Guayana area from the Guianas to Venezuela, and extending south in eastern Brazil to the states of Goyaz, Bahia, and Minas Geraes. The genus has not been treated since the account by Schumann in Martius's Flora Brasiliensis in 1889 (**6**^{6}: 87–91). One of the species from Minas Geraes, Brazil, described as new below has been an herbarium name for the past three decades, while another from the same state is as yet inadequately known.

An interesting feature of the genus is the dimorphism of the corollas of some of the species, especially in *P. galioides,* in which flowers having long-exserted styles and included anthers on short filaments contrast with those having shorter included styles and stamens on filaments exserted from the orifice. Great variation is exhibited in the pubescence and foliage of the plants as well as habit, leading to many intergrading forms. In general, however, the species are well-characterized in a distinct, well-marked genus, which is notable in possessing a 2-parted calyx and a circumscissile dehiscent capsule.

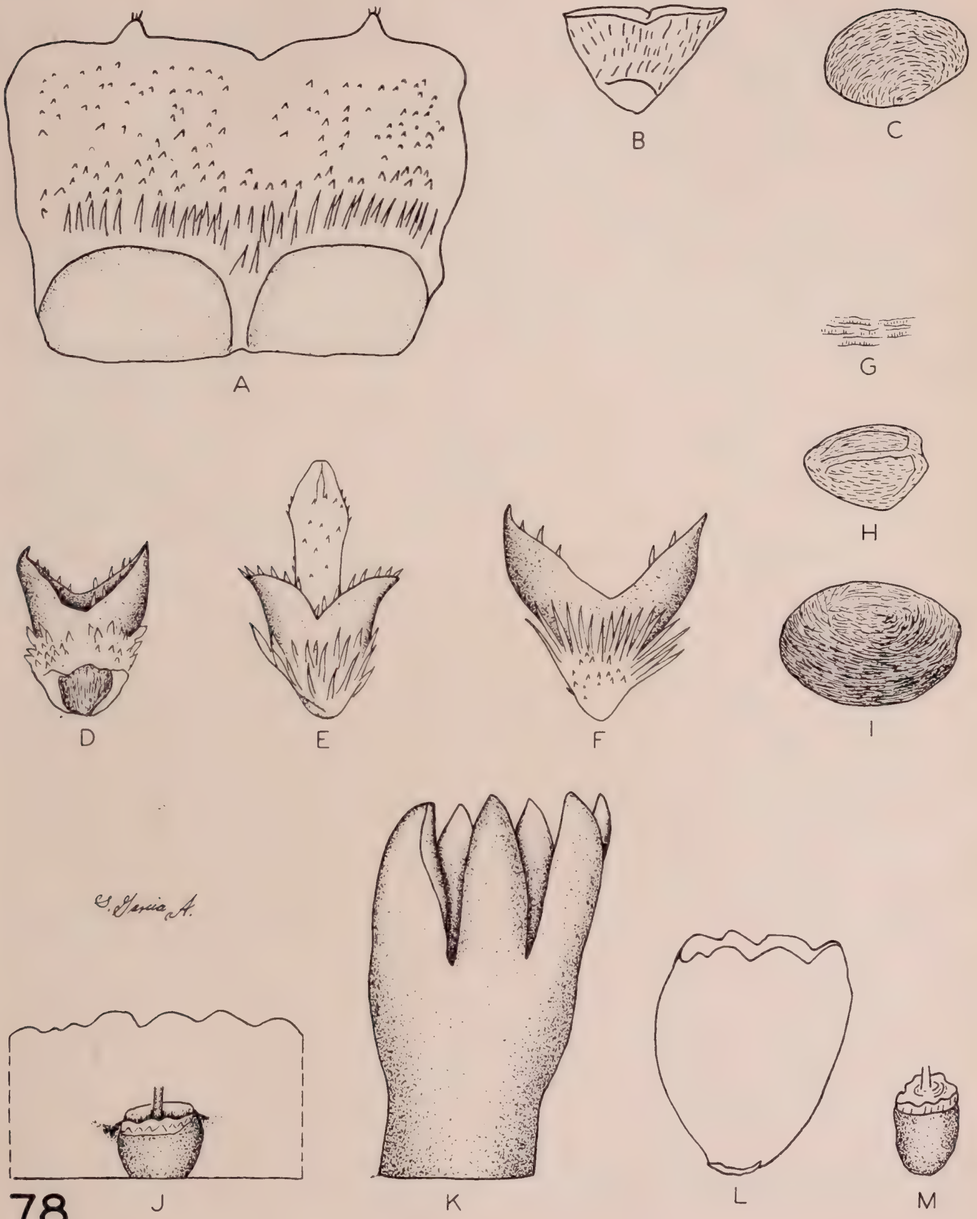
Key to the Species of *Perama*

1. Leaves either rosulate and clustered at the base of the plant, or, if not clustered, commonly 25–90 mm long and 10–25 mm wide; calyx-lobes ovate or suborbicular-ovate to triangular, the lobes shorter than or only slightly longer than the hypanthium or ovary.
  2. Inflorescence commonly of 2–6 glomerate spikes, rarely solitary; calyx navicular, the lobes 1–1.8 mm long; corolla-tube densely and conspicuously pubescent; leaves crowded at or near the tips of the subligneous or herbaceous, thickened stems. 1. *P. plantaginea.*
  2. Inflorescence of solitary heads on the branches; calyx segments broadly triangular to ovate, 0.5–1.2 mm long; corolla-tube sparsely and minutely puberulent to moderately villosulous; leaves rosulate, at the base of the filiform stems. 2. *P. dichotoma.*
1. Leaves borne along the length of the stem from base towards summit, 2–13 mm long, 0.2–4.5 mm wide; calyx-lobes setaceous or linear-lanceolate, much longer than the hypanthium or ovary.
  3. Leaves ternate or quaternate. 3. *P. galioides.*
  3. Leaves in pairs.
    4. Corolla rose; flowers among the dense mass of leaves in the upper part of the stem; corolla-lobes and stamens 5. 6. *P. vellerea.*
    4. Corolla yellow; flowers in a definite head terminating the stem or branches of the stem; corolla-lobes and stamens 4.
      5. Stem simple, monocephalous, 1.5–4 cm tall; all the leaves linear-lanceolate; calyx equaling corolla or nearly so; seeds minutely scrobiculate with superficial cells. 4. *P. mexiae.*
      5. Stem usually branched and frequently with 2-many heads, rarely simple and monocephalous, 10–40 cm tall; lower leaves commonly ovate to lanceolate; calyx shorter than the corolla-tube; seeds lineolate. 5. *P. hirsuta.*

1. **Perama plantaginea** (H.B.K.) Hook. f. in Benth. & Hook. Gen. Pl. **2**: 148. 1873. Fig. 78, A–C.

Buchia plantaginea H.B.K. Nov. Gen. & Sp. **2**: 270. *pl. 132.* 1819.

Distribution: at low altitudes in drainage of the upper Río Negro and Orinoco from the rivers Orinoco, Guainia, and Negro in Venezuela, to the Rio Içana in Amazonian Brazil.



78

FIG. 78. A–C, *Perama plantaginea.* A, calyx and hypanthium, spread open, viewed from within, showing setose hairs above locules of ovary, × 15. B, calyx and hypanthium, natural position, × 7.5. C, seed, × 20. D, *Perama dichotoma* var. *scaposa* (*Steyermark 58033*), calyx and hypanthium with exposed seed below, × 12.5. E–I, *Perama dichotoma* var. *dichotoma.* E, (*Pires 707*), flower with corolla in aestivation, × 12.5. F, (*Schomburgk 968*), calyx and hypanthium, × 15. G, (*Schomburgk 968*), highly magnified portion of immature face of seed. H, (*Schomburgk 968*), immature seed, × 25. I, (*Maguire, Cowan and Wurdack 29744*), mature seed, finely lineolate, × 35. J–L, *Schradera brevipes.* J, calyx and hypanthium from within, spread open to show attachment and position of ovary and base of style, × 3.5. K, corolla, × 5. L, calyx and hypanthium, × 5. M, ovary removed from calyx to show annular disk and base of style, × 2.5.

VENEZUELA. Amazonas: locis humidis prope Javita Orinocensium, *Humboldt & Bonpland 974* (photo of holotype at B in F, NY); bog, Río Negro, at base of Cerro Cucuy, 2 Mar 1944, *J. T. Baldwin, Jr. 3213* (F, US, VEN); a lo margo de un camino en la selva de Maroa; alt. 127 m; hierba de 15 a 30 cm; alrededor de los arboles; 9 Feb 1942, *Llewelyn Williams 14198* (F); en la selva alta, tupida de Yavita; alt. 128 m; 24 Jan 1942, *Williams 13967* (F); cienega de ciperaceas, cerca Jacamín, Río Casiquiare; 25 Jan 1958, *Vareschi & Madgefau 6740* (VEN); infrequent in forest near Base Camp, Cerro Sipapo (Paráque); alt. 125 m; perennial herb; flowers white; 1 Jan 1949, *Maguire & Politi 28061* (NY); occasional in sabanita along Yavita-Pimichin trail near Pimichin, Río Guainia; alt. 120–140 m; 22 Nov 1953, *Maguire, Wurdack, & Bunting 36325* (NY); frequent in sabanita 1 km east of Maroa, Río Guainia; alt. 125 m; 16 Apr 1953, *Maguire & Wurdack 35691* (NY); occasional in savanna 0.5 km east of Maroa, Río Guainia; alt. 130 m; 6 Oct 1957, *Maguire, Wurdack, Keith, & C. K. Maguire 41712* (NY); Sabana Manacal, Río Atabapo, 15 km above Guarinumo; alt. 125 m; 12 Jun 1959, *Wurdack & Adderley 42955* (NY). COLOMBIA. Vaupes: frequent in sabanita 0.5–1.5 km north of Puerto Colombia (opposite Maroa); alt. 130 m; 12 Oct 1957, *Maguire, Wurdack, Keith, & C. K. Maguire 41854* (NY). BRAZIL. Amazonas: Bôca do Içana, Estacamento, caatinga baixa; arbusto, 20–40 cm; flor branca; 17 May 1948, *Black 48–2727* (NY); Rio Içana, Tunuí; 1947, *J. Murça Pires 1910* (NY).

This species was originally described by Humboldt, Bonpland, & Kunth in the verbenaceous genus *Buchia* and later transferred to its proper position in the Rubiaceae as congeneric with *Perama* by Hooker filius in Bentham & Hooker's Genera Plantarum. K. Schumann in the Flora Brasiliensis gave it only brief mention, while Standley, in his Rubiaceae of Venezuela (Field Mus. Bot. Ser. **7**: 475. 1931) knew it only from a photograph of the holotype specimen, likewise describing the species very briefly.

Some variation is shown in the amount of indument of the lower surface of the leaf-blades, in leaf-shape, and in length of peduncle. In *Wurdack & Adderley 42955* one specimen of the collection has sessile heads, whereas most of the inflorescences in the same collection are variously pedunculate. Also, in this collection the lower surface of the leaf-blades are only sparsely sericeous to nearly glabrate. There is likewise variation in habit from subacaulescent herbaceous stems to elongated subligneous ones with elongated internodes.

2. Perama dichotoma Poepp. & Endl. Nov. Gen. & Sp. **3**: 29. *pl. 235*. 1845; K. Schumann, in Mart. Fl. Bras. **6**(6): 91. *pl. 86*. 1889.

Key to the Varieties of *Perama dichotoma*

1. Entire lower surface of leaf-blades completely covered with dense hirsutulous pubescence, concealing the main nerves. 2c. *P. dichotoma* var. *hirsutula.*

1. Lower surface of leaf-blades glabrous to hirsutulous or villous only along the principal nerves, elsewhere glabrous or only sparsely pubescent, the main nerves evident and not concealed by the pubescence.
    2. Lower surface of leaf-blades glabrous or with appressed inconspicuous hairs 0.1–0.5(–1) mm long; upper surface of leaf-blades with hairs 0.2–1(–2) mm long. 2b. *P. dichotoma* var. *scaposa.*

2. Lower surface of leaf-blades with rather conspicuous, loosely spreading hairs mainly (0.75)1–2.25 mm long; upper surface of leaf-blades generally with hairs (0.5)1–3 mm long. 2a. *P. dichotoma* var. *dichotoma.*

2a. **Perama dichotoma** var. **dichotoma** Fig. 78, E–I.

Perama dichotoma Poepp. & Endl. Nov. Gen. & Sp. **3**: 29. *pl. 235.* 1845.

Distribution. Dry or moist rocky, usually sandy open or shaded ground in savanna, border of forest, or in forest bordering streams, British Guiana, sandstone tepuis, mesas, and sandy areas of the Gran Sabana of southern Venezuela, and Amazonian Brazil from the Rio Pará to the Rio Içana in the upper Rio Negro drainage, at elevations from near sea level ascending to 1980 m in the Gran Sabana of Venezuela.

BRITISH GUIANA. Dry rocky ground, savannas, Kaieteur Plateau; 4 May 1944, *Maguire & Fanshawe 23211* (NY, VEN); Imbaimadai, Imbaimadai Savannas, Pakaraima Mountains, Upper Mazaruni River; alt. 1300 m; 24 Oct 1951, *Maguire & Fanshawe 32266* (NY); wet forest, East Coast Water Conservancy, southeast of Georgetown; sand reef at head of Hoorubia Creek; 26 Nov 1919, *A. S. Hitchcock 16951* (NY). VENEZUELA. Bolivar: Roraima, 1842–3, *Schomburgk 968* (NY); moist rocky areas along Río Caroní near rapids just below Urimán; locally frequent; alt. 393 m; herb; 11 Jan 1955, *Steyermark & Wurdack 69* (F, NY, VEN); Río Arequi, Cerro de las Guacamayas; alt. 800 m; 9 June 1954, *Bernardi 1667* (NY, Univ. Andes, Merida); Río Uairen, Alto Caroní; 25 Apr 1946, *Lasser 1710* (NY, VEN); lugares humedos y algo sombreados, Auyantepui; alt. 1800 m; Apr 1956, *Foldats 2631* (VEN); Boca Auraima, Río Paragua; 6 Sep 1943, *Cardona 883* (VEN); white sand, Salto de Auraima, Río Paragua; alt. 275 m; 10 Apr 1943, *Killip 37356* (F, US, VEN); muddy sabana, Río Tonoro, Alto Río Paragua; 20 Aug 1943, *Cardona 835* (NY, US, VEN); cumbre del Cerro Tonoro, Alto Paragua; alt. 700 m; 15 Aug 1943, *Cardona 855* (VEN); vicinity of Salto de Pacairao, about 3 km E to NE of Santa Teresita de Kavanayén; alt. 1220 m; 24 Nov 1944, *Steyermark 60504;* vicinity of "Misia Kathy Camp," Ptari-tepuí; alt. 1585 m; 28 Oct 1944, *Steyermark 59470* (F, NY, VEN); Sierra Ichún: above waterfall; 27 Dec 1961, *Steyermark 90286* (NY, VEN); Sierra Ichún: mossy open rocks along shore, on north side of Río Ichún; 28 Dec 1961, *Steyermark 90330* (NY, VEN); same locality and date, *Steyermark 90342;* wet savanna, 2 km south of Río Chibau, Río Chicanán, Alto Río Cuyuni; alt. 100 m; 1 Sep 1962, *Bassett Maguire, Julian A. Steyermark, & Celia K. Maguire 53548* (NY, VEN); Cerro Pitón, Cordillera Epicara, Río Chicanán, Alto Río Cuyuni; alt. 400 m; 5 Sep 1962, *Bassett Maguire, Julian A. Steyermark, & Celia K. Maguire 53621* (NY, VEN). Amazonas: Savana Hills, summit of Cerro Duida; alt. 1025–1200 m; 2 Sep 1944, *Steyermark 58245* (F, NY); Brocchinia Hills, summit of Cerro Duida; 1 Sep 1944, *Steyermark 58166* (F, NY, VEN); locally frequent in cumbre, Cerro Yapacana, Río Orinoco; alt. 1200 m; 3 Jan 1951, *Maguire, Cowan, & Wurdack 30654* (NY); frequent in savanna near Base Camp, Cerro Sipapo (Paráque); alt. 125 m; 30 Dec 1948, *Maguire & Politi 28032* (NY); frequent, banks Culebra Creek above Culebra Falls, Cerro Duida; alt. 1500 m; 25 Nov 1950, *Maguire, Cowan, & Wurdack 29744* (NY). BRAZIL. Amazonas: Rio Içana, Tunuí, pé da Serra; 23 Oct 1947, *J. Murça Pires 707* (NY). Para: in campis arenosis herbidis, insulae Colares flumini Pará, June 1832, *Poeppig 2994* (isotype of *P. dichotoma,* NY).

2b. Perama dichotoma var. **scaposa** (Gleason & Standley) Steyerm., comb nov. Fig. 78, D.

Perama scaposa Gleason & Standley, Field Mus. Bot. Ser. **7**: 475–476. 1931.

Distribution: damp sandstone cliff faces and along streams on upper slopes and summits of the sandstone table mountains of Cerro Duida and Serrania Parú in western Venezuela, locally on the Kaieteur Plateau of British Guiana and Tafelberg in Surinam, at altitudes of 1430–2215 m.

VENEZUELA. Amazonas: summit of Peak no. 7, summit of Mount Duida; alt. 2215 m; Aug 1928–April 1929, *G. H. H. Tate 664* (holotype of *P. scaposa*, NY, isotype, F); Ridge 23 C, summit of Mount Duida, same date; *Tate 704* (paratype of *P. scaposa*, NY); Caño Sapo, summit of Mount Duida; alt. 1938 m; Aug 1928–April 1929, *Tate 597* (paratype of *P. scaposa*, NY); sandy stream bank at Central Camp, summit of Mount Duida; alt. 1500 m; 20–28 Dec 1928, *Tate 548* (paratype of *P. scaposa*, NY); on high moist ridge top, summit of Cerro Duida; alt. 1820–2075 m; 4 Sep 1944, *Steyermark 58334* (F, NY); moist exposed cliff face with *Brocchinia tatei*, Caño Negro, Cerro Duida; alt. 1560 m; 25–26 Aug 1944, *Steyermark 58033* (F, NY, VEN); occasional in cumbre along west rim, Serranía Parú; alt. 2000 m; 2 Feb 1951, *Cowan & Wurdack 31143* (NY); Serrania Parú; alt. 2000 m; 4 Feb 1951, *Cowan & Wurdack 31208* (NY); frequent along Culebra Creek, Cerro Duida; alt. 1600 m; 22–24 April 1949, *B. Maguire & B. Maguire, Jr. 29081* (NY); Caño Negro basin, Cerro Duida; alt. 2000–2300 m; 23 Nov 1950, *Maguire, Cowan, & Wurdack 29700* (NY). BRITISH GUIANA. Kaieteur Savannah; alt. 343 m; 4 Sep 1937, *Sandwith 1353* (NY). SURINAM. Base of dripping cliffs, Tafelberg; 28 July 1944, *Maguire 24192* (NY).

2c. Perama dichotoma var. **hirsutula** Steyerm., var. nov.

A var. *dichotoma* foliis subtus omnino dense pubescentibus pilis plerumque 1.5–2 mm longis recedit.

VENEZUELA. Bolívar: along stream, vicinity of camp 150 at km 150 in valley of savanna of Río Uarama, northeast of Luepa; alt. 1220 m; 24–25 April 1960, *Steyermark & S. Nilsson 561* (holotype, VEN, isotype, Upssala).

Known only from the type in the Gran Sabana, state of Bolívar, eastern Venezuela, near the British Guiana border, at altitudes of 1220 m.

When Poeppig and Endlicher described their *Perama dichotoma* from the Rio Pará, Brazil (Nov. Gen. & Sp. **3**: 29. *pl. 235.* 1845), they made no mention in their description of the relative glabrity or indument of the calyx and hypanthium, and their plate shows these parts completely glabrous. They further stated that the corolla was externally glabrous, and that the seeds were smooth. K. Schumann (in Martius's Flora Brasiliensis **6**(6): 91. *pl. 86.* 1889) later described the calyx as shortly ciliate or aculeate-serrulate and the ovary as glabrous, while the seeds were described as transversely lineolate.

In 1931 Gleason & Standley (Field Mus. Bot. Ser. **7**: 475–6) segregated *Perama scaposa*, on the basis of Tate's collections from the summit of Cerro Duida. They attempted to distinguish it on the basis of its densely paleaceous-pubescent hypanthium and smooth globose seeds, as contrasted with the supposed glabrous hypanthium and 3-angled lineolate (''punctate'') seeds of *P. dichotoma.*

An examination of an isotype specimen of *P. dichotoma* (*Poeppig & Endlicher 2994*) in NY reveals a calyx which has the margins aculeolate-ciliolate or shortly hispidulo-ciliolate, whose hypanthium is definitely hispidulo-setulose at the summit, elsewhere irregularly short setulose or papillate short-hirtellous on the surface, but definitely not glabrous as illustrated by Poeppig & Endlicher nor described as such by Schumann or by Gleason & Standley. The seeds in the Poeppig & Endlicher collection are immature and rather flattened, but under high magnification a characteristic lineolate surface is faintly revealed. The *Schomburgk 968* specimen, cited by Schumann under *P. dichotoma,* likewise shows the hypanthium to be hispidulo-setulose at the summit and elsewhere below shortly hispidulous.

Moreover, the holotype and isotype specimens, together with the paratypes of *P. scaposa* Gleason & Standley, show the same type of hispidulous hypanthium and transversely lineolate seeds as in *P. dichotoma.* In fact, a critical study of herbarium material of these two taxa does not reveal any differences whatsoever as regards the surface markings of the seeds or their angulate character nor the hispidulous surface of the hypanthium. The two taxa, therefore, cannot be separated on the basis of the characters used by Gleason and Standley. However, one difference—that of the matter of the relative density and length of the hairs on the lower surface of the leaf-blade—does emerge to become the chief and only criterion for distinguishing the two taxa. Although there is some intergradation in this character, resulting in several intergrading specimens, most of the material can be segregated on this basis. The most widespread variation is typical var. *dichotoma,* in which the hairs along the nerves of the lower surface are loosely spreading and fairly conspicuous, varying in length mainly from (0.75)1–2 mm long. In the material of var. *scaposa,* on the other hand, the hairs along the nerves of the lower surface are either absent or minute, more or less appressed, and inconspicuous, varying chiefly from 0.1–0.5 mm, rarely up to 1 mm long. In both varieties the upper surface of the leaf is usually densely villous or hirsutulous, the var. *scaposa* tending to have usually relatively shorter and fewer hairs than in var. *dichotoma,* although there is much intergradation. In one variation, var. *hirsutula,* both surfaces of the leaves are densely hirsutulous, the hairs on the lower surface completely hiding the main nerves. Specimens which are intermediate between var. *dichotoma* and var. *scaposa* are *Cardona 883, Killip 37356, Steyermark 58166, Maguire & Fanshawe 23211, Maguire, Cowan, & Wurdack 30654* and *29744, Maguire & Maguire, Jr. 29081,* and *Maguire & Politi 28032.* These specimens show intergrading lengths and density of indument along the nerves of the lower leaf surface. It is possible that the var. *scaposa* may eventually have to be united with var. *dichotoma.* This may await more detailed field observations and breeding and transplanting experiments.

Individual plants, as well as local colonies, are sometimes encountered with the pairs of lower leaves separated by elongated internodes 0.5–4 cm long and/or with larger leaves 4–5 cm long and 1.6–2.7 cm broad. This type of variation with large leaves and elongated internodes is represented by the collection of *Maguire, Steyermark, & Maguire 53621* (cited above), whereas the elongated internode variation with smaller leaves may be noted in the collection of *Maguire, Steyermark, & Maguire 53548.* In the latter, the leaves are both rosulate as well as on elongated internodes, whereas in the former (no. *53621*), all the individuals of the local colony exhibited the comparatively larger leaf blades of 4–5 cm in length.

With its rosettes of leaves which are often lavender below and the little heads of white to blue or lavender-blue corollas, the plants of this taxon are delicately beautiful subjects, which lend themselves as interesting herbaceous material for rock gardens and garden beds. They are characteristic of the upper slopes and summits of the sandstone table mountains throughout southern Venezuela, ascending to the tops of these tepuis, as well as occurring elsewhere in areas of lower altitude in sandy soil or along sandy rocks bordering streams, or near sea-level, as near Georgetown, British Guiana, and along the Rio Pará and Rio Içana in Amazonian Brazil. They are further unique in being annuals, a type of plant rarely encountered on the summits of the sandstone table mountains.

3. **Perama galioides** (H.B.K.) Poir. Dict. Nat. **38**: 414. 1825.

Mattuschkea galioides H.B.K. Nov. Gen. & Sp. Pl. **2**: 272. 1817; Spreng. Syst. Veg. ed. 16, **1**: 418. 1825.

Distribution. Southern Venezuela and British Guiana at elevations of 80–1100 meters.

Key to the Varieties and Forms of *Perama galioides*

1. Corolla 6.5–8 mm long, the tube (including limb) 5–6.5 mm long, the limb externally glabrous or minutely papillate-puberulent; anthers 1.3–1.7 mm long. 3d. *P. galioides* var. *longiflora.*

1. Corolla 4–6.5 mm long, the tube (including limb) 2.5–4.5 mm long, the limb externally usually more or less pilosulous, rarely sparingly puberulent or glabrous; anthers 0.7–1.3 mm long.

  2. Stem glabrous to appressed-pubescent, the hairs in the lower portion not loosely spreading.

    3. Leaves mainly ternate, rarely quaternate, 0.5–1.5 mm wide; heads 4.5–12 mm long; seeds 0.6–0.7 mm long; stem commonly simple and monocephalous to branched with 3 heads, rarely more, the upper internodes mostly elongated with few whorls of short leaves at the upper nodes.

      4. Leaves chiefly or always ternate. 3a. *P. galioides* var. *galioides* f. *galioides.*

      4. Leaves chiefly or always quaternate. 3b. *P. galioides* var. *galioides* f. *quaternata.*

    3. Leaves mainly quaternate, 1.5–4 mm wide; heads 9–25 mm long; seeds 0.9–1 mm long; stem commonly much-branched with 3–10 heads, rarely monocephalous, conspicuously foliose at all the nodes with well-developed leaves at all the nodes. 3c. *P. galioides* var. *galioides* f. *macrocephala.*

  2. Stem with some degree of spreading pubescence at least in lower portion or at base.

    5. Calyx-divisions mainly loosely spreading, those from the lower and middle part of the head divaricate, horizontal, or reflexed; flower-heads up to 8 mm wide, 11 mm long; nerves on lower surface of leaves somewhat prominent, but those on either side of midrib less conspicuous or not prominently elevated; stems and foliage, at least in dried state, dull or drab dark green, most of the hairs white, gray, or colorless.

      6. Hairs on calyx, stems, and, when present on leaves, buff to stramineous or ochroleucous at base. 3e. *P. galioides* var. *hispida* f. *hispida.*

      6. Hairs on calyx, stems, and leaves gray-white, the plant with a gray-hoary appearance. 3f. *P. galioides* var. *hispida* f. *cinerea.*

    5. Calyx-divisions strongly arched-ascending, erect-ascending, or arched-incurving above; flower-heads up to 10 mm wide and 15 mm long; all the nerves on lower surface of leaves equally prominent and conspicuously elevated; stems and foliage, at least in dried state, dull olive green with usually yellow hairs.

      7. Pubescence of stems and both surfaces of leaves dense and conspicuous, that of stems 1–2 mm long, that of leaves 1.5–1.75 mm long; calyx-divisions 4–4.5 mm long; leaves mainly divaricately spreading; leaves mainly quaternate, sometimes ternate. 3h. *P. galioides* var. *densipila.*

      7. Pubescence of stems and both surfaces of leaves less conspicuous or more sparsely distributed, that of stems 0.5–1 mm long, that of leaves 0.7–1.5 mm long; calyx-divisions 2.5–4 mm long; leaves erect-ascending to spreading; leaves mainly ternate. 3g. *P. galioides* var. *intermedia.*

3a. Perama galioides var. **galioides** f. **galioides** Fig. 79, A–D.

Perama galioides (H.B.K.) Poir. Dict. Nat. **38**: 414. 1825.
Mattuschkea galioides H.B.K. Nov. Gen. & Sp. Pl. **2**: 272. 1817; Spreng. Syst. Veg. ed. 16, **1**: 418. 1825.

Distribution. Southern Venezuela at elevations of usually 100–415 meters among rocks in open savanna and along sandy banks of streams.

VENEZUELA. Amazonas: ad flumen Orenoco, prope Esmeralda, Dec 1853, *Spruce 3236* (NY); Esmeralda; 15 May 1942, *Llewelyn Williams 15380* (F, VEN); Esmeralda; 13 May 1942, *Williams 15321* (F, VEN); Esmeralda Ridge; 21 Aug 1944, *Steyermark 57756* (F, NY, VEN); Grand Savanna, Esmeralda; 1 Nov 1928, *Tate 290* (NY); open savanna, Esmeralda; 3 Oct 1928, *Tate 180* (NY); Esmeralda Ridge, Alto Río Orinoco; alt. 150–200 m; 23 Mar 1953, *Maguire & Wurdack 34653* (NY); Savanna No. 3, northwest base of Cerro Yapacana, Río Orinoco; alt. 130 m; 1 Jan 1951, *Maguire, Cowan, & Wurdack 30530* (NY); Savanna No. 3, Cerro Yapacana, Río Orinoco; 20 Nov 1953; *Maguire, Wurdack, & Bunting 36589* (NY); Maroa, Alto Río Negro; alt. 127 m; 13 Feb 1942, *Williams 14332* (VEN); Maroa, Río Guainía; 1942, *Williams 14321a* (F). Bolivar: Río Abácapa, Chimantá Massif; alt. 415 m; 29 Mar 1953, *Steyermark 74696* (F, NY, VEN); sabana de bromeliaceas, Auyan-tepui; alt. 1100 m; Apr 1956, *Vareschi & Foldats 4628b* (VEN).

3b. Perama galioides var. **galioides** f. **quaternata** Steyermark, f. nov.

A var. *galioides* f. *galioides* foliis plerumque quaternatim verticillatis recedit, foliis supremis saepe ternatis; foliis plerumque linearibus vel lineari-lanceolatis, plerumque 0.2–1.5 mm latis, rariter ad 2 mm latis.

Distribution. Savannas in southern Venezuela at elevations of 120–750 m.

VENEZUELA. Amazonas: en los claros en la sabana de San Antonio, Upper Orinoco; alt. 121 m; 27 Apr 1942, *Llewelyn Williams 15067* (holotype F, isotype VEN); Sabana de San Antonio; 27 Apr 1942, *Williams 15024* (paratype VEN). Bolívar: playas del raudal Karukuyá, Río Caroní; alt. 740 m; 9 Oct 1946, *Cardona 1785* (VEN).

The *Cardona 1785* collection, with stems densely foliose, short internodes, and broad leaves commonly 2 mm wide, is atypical.

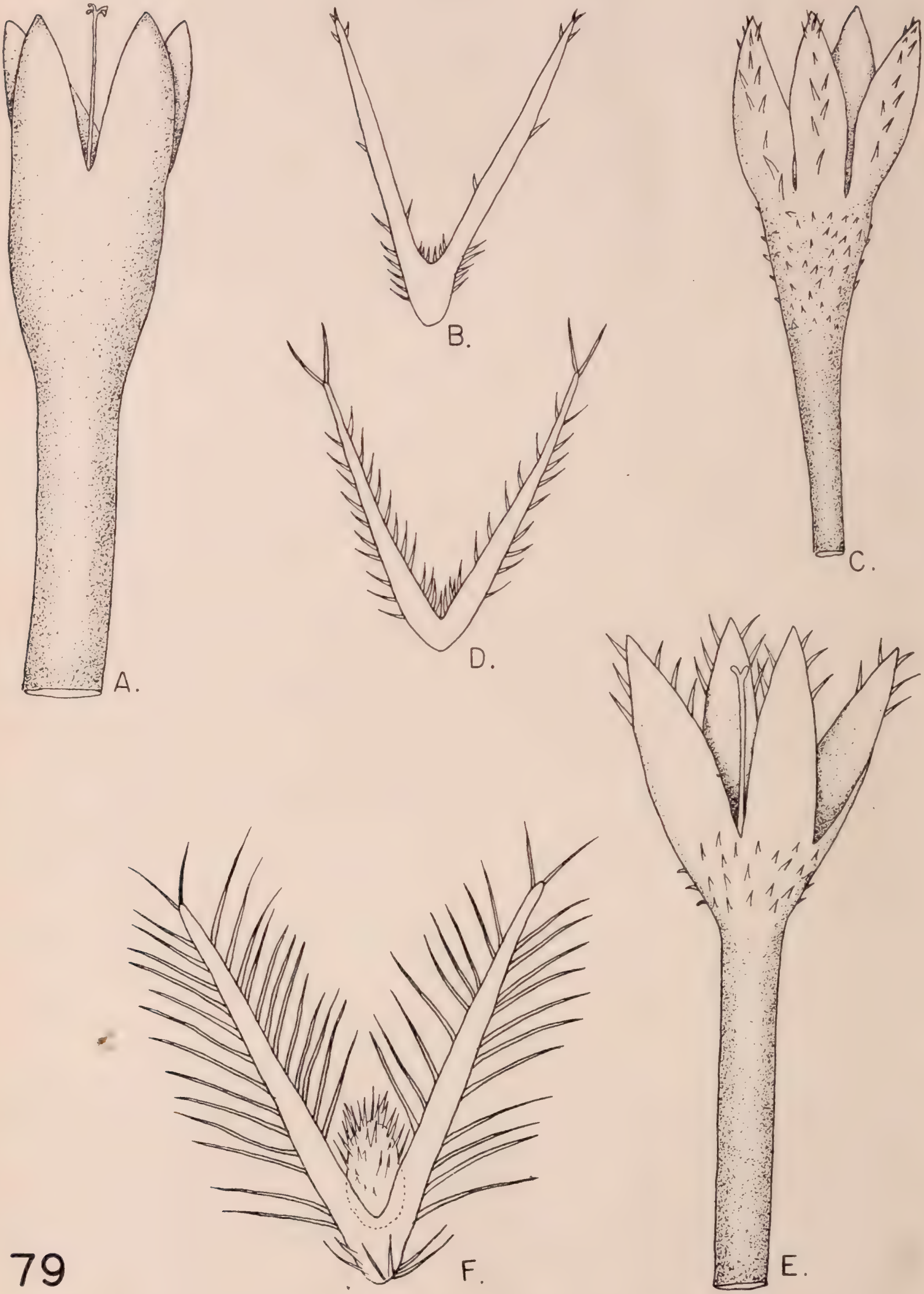
3c. Perama galioides var. **galioides** f. **macrocephala** Steyermark, f. nov.

A var. *galioides* f. *galioides* inflorescentiis elongatis 9–25 mm longis, seminibus 0.9–1 mm longis recedit; caulibus glabris vel adpresso-pubescentibus saepe valde 5–10-ramosis saepe cum 5–10 inflorescentiis; foliis plerumque manifeste patentibus 1.5–4 mm latis; corollis 6 mm longis, tubo 4.5 mm longo.

Distribution. Known only from Serrania Parú, southwestern Venezuela.

VENEZUELA. Amazonas: frequent in savanna at west end of Cerro Parú near Caño Asísa, Serrania Parú; alt. 200 m; 15 Feb 1951, *Cowan & Wurdack 31455* (holotype NY).

This is distinguished from typical *P. galioides* var. *galioides* f. *galioides* by its quaternate, spreading, broader leaves, more elongated heads, larger seeds, and more foliose and more branched stems with more numerous heads of flowers. The heads may attain a length of 25 mm. The corollas are also longer than in typical var. *galioides,* attaining 6 mm in length with a corolla-tube 4.5 mm. It perhaps



79

FIG. 79. A–D, *Perama galioides* var. *galioides*. (A–B, *Maguire & Wurdack 34653; C–D, Williams 15380*). A, corolla, × 15. B, calyx and hypanthium, × 15. C, corolla, × 15. D, calyx and hypanthium, × 15. E–F, *Perama galioides* var. *densipila*. E, corolla, × 15. F, calyx and hypanthium, × 15.

may represent a hybrid population between var. *galioides* f. *quaternata* and var. *longiflora.*

3d. Perama galioides var. **longiflora** Steyermark, var. nov. Fig. 80, D–G.

A var. *galioides* f. *galioides* corollis 6.5–8 mm longis, tubo 5–6.5 mm longo, antheris 1.3–1.7 mm longis recedit; caulibus glabris vel superne parce adpresso-pubescentibus; foliis 3–4-verticillatis glabris 1.5–2.5 mm latis inferne confertis internodiis brevibus; calycis segmentis 4–4.5 mm longis glabris vel parce ciliatis pilis 0.2–0.8 mm longis; corollae limbo extus glabro vel parce minute puberulenti, lobis extus pilis brevibus paucis instructis.

Distribution. Known only from the upper Río Orinoco, near mouth of Río Ventuari, in southwestern Venezuela at an elevation of 125 m.

VENEZUELA. Amazonas: locally abundant in Sabana de Mayo, right bank of Río Orinoco, 10 km above mouth of Río Ventuari; alt. 125 m; 31 Jul 1959, *Wurdack & Adderley 43692* (holotype NY).

The corollas, calyx, and anthers are longer than in typical var. *galioides* or any of the other variations of *P. galioides.* In the short-styled, long-exserted anther type of flower, the corollas are longer, 7–8 mm long with the tube 6–6.5 mm long, whereas in the long-styled, included anther type the corollas are somewhat shorter, 6.5–7 mm long with the tube 5–5.5 mm long. In general, there appears to be less marked ampliation of the corolla-limb, at least in the exserted stamen type of corolla, than in the other varieties of *P. galioides.* The corolla-limb is glabrous to minutely puberulent without and sparingly subhirtellous without with a few short setae near tip.

Aparently, var. *longiflora* represents a variation of *P. galioides* with longer corollas, calyx, and anthers, but in other respects is mostly like typical *P. galioides* var. *galioides.*

3e. Perama galioides var. **hispida** (H.B.K.) Steyermark, comb. nov. Fig. 80, A–C.

Mattuschkea hispida H.B.K. Nov. Gen. & Sp. Pl. **2**: 271. 1817.

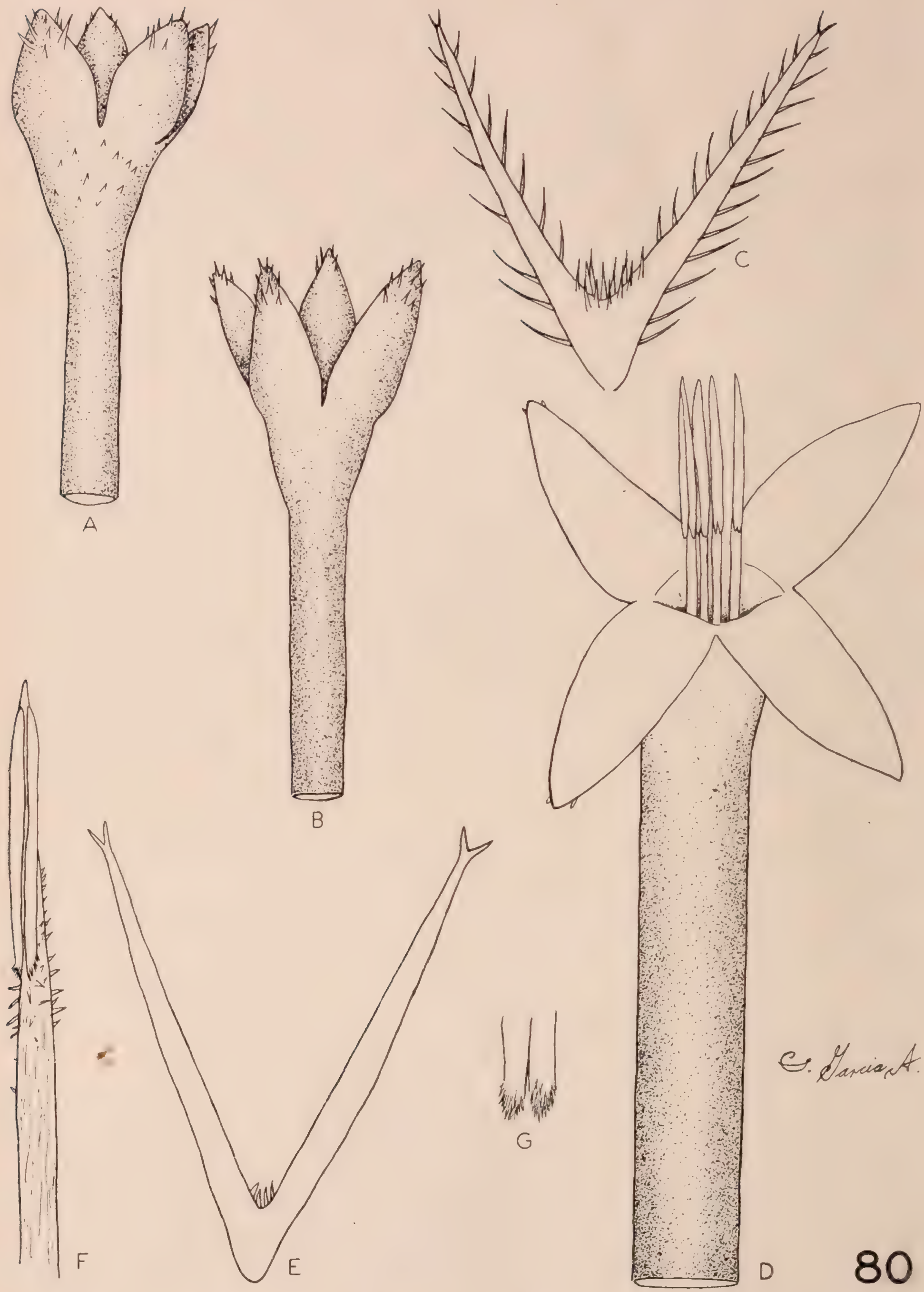
This consists of the following two forms, as distinguished in the key to varieties and forms.

Perama galioides var. **hispida** f. **hispida**

Perama galioides var. *hispida* (H.B.K.) Steyermark.
Mattuschkea hispida H.B.K. Nov. Gen. & Sp. Pl. **2**: 271. 1817.

Distribution. Usually low, rather moist savannas of southwestern and southern Venezuela.

VENEZUELA. Amazonas: Atures, *Chaffanjon 177,* ex herb. Paris (topotype, F); Savanna of Atures, Sept 1887, *A. Gaillard 267,* ex herb. Paris (topotype, F); Puerto Ayacucho, Alto Orinoco; 23 May 1940, *Williams 13089* (F, VEN); occasional in low-lying park-like savanna at Santa Barbara, junction of rios Orinoco and Ventuari; 22 Feb 1951, *Cowan & Wurdack 32036* (NY); abundant on savanna on left bank of Caño Caname just below Limoncito, Río Guainia; alt. 130 m; 14 Oct 1957, *Maguire, Wurdack, Keith, & Maguire 41884* (NY); Sabana Pacimoni, Río Pacimoni; 2 Oct 1957, *Maguire, Wurdack, Keith, & Maguire 41667* (NY); savanna on left bank of Caño Hechimoni, Río Siapa; 9 Feb 1954, *Maguire, Wurdack, & Bunting 37614* (NY); Cerro Guanay: Caño Verada; 30 Jan 1951,



80

FIG. 80. A–C, *Perama galioides* var. *hispida*. (A, *Williams 13089*; B–C, *Maguire, Wurdack & Maguire 41667*). A, corolla, × 15. B, corolla, × 15. C, calyx and hypanthium, × 15. D–G, *Perama galioides* var. *longiflora*. D, corolla, × 15. E, calyx and hypanthium, × 15. F, stamen, × 25. G, base of anther, × 50.

Maguire 31644 (NY). Bolívar: Auyan-tepui; alt. 1100 m; Apr 1956, *Vareschi & Foldats 4576 f.* (VEN); Sierra Ichún: Salto María Espuma, Río Paragua; 28 Dec 1961, *Steyermark 90389 A* (NY, VEN).

The type collection of *Mattuschkea hispida* H.B.K., basionym of *Perama hispida,* was collected by Humboldt and Bonpland from "arenosis humidis prope Atures Orinocensium" (Nov. Gen. & Sp. Pl. **2**: 271. 1817). I have not seen the holotype, but have interpreted the topotype collections of *Chaffanjon 177, A. Gaillard 267,* and *Williams 13089,* as representing the plant described by Humboldt and Bonpland. These topotype collections are in agreement with such items in the description as: "ramis . . . hispidis," "Folia terna, linearia aut lineari-lanceolata, hispidula," "Calyx . . . laciniis margine hispido-ciliatis." Although the leaves in the *Williams 13089* and *Gaillard 267* specimens are slightly broader and less generally linear or linear-lanceolate, the *Chaffanjon 177* collection is a better match in this respect. However, all three collections exhibit the pubescent leaves and stems. Since the lower portion of the stems in the *Williams 13089* collection has spreading hairs, I have interpreted the *Mattuschkea hispida* as a taxon having spreading hairs on the lower part of the stem.

Of the collections cited above two are atypical. One (*Maguire, Wurdack, & Bunting 37614*) with the outer surface of the corollas glabrous and with the spreading leaves glabrate to only sparsely pubescent may represent a hybrid between var. *galioides* and var. *hispida.* It is placed in the var. *hispida* because of the spreading hairs on the lower portion of the stem. The other, represented by *Maguire, Wurdack, Keith, & Maguire 41667,* has the heads elongated to 17 mm long, varying from 5–17 mm, but otherwise appears to be referable to var. *hispida* f. *hispida.*

3f. **Perama galioides** var. **hispida** f. **cinerea** Steyermark, f. nov.

A var. *galioides* f. *hispida* pilis densis cinereis vel albidis recedit; foliis ternatim verticillatis incrassatis marginibus revolutis.

Distribution. Known only from southwestern Venezuela.

VENEZUELA. Amazonas: occasional in montane caño savanna, Cerro Moriche, Río Ventuari; alt. 800 m; 14 Jan 1951, *Maguire, Cowan, & Wurdack 30886* (holotype NY); Puerto Ayacucho; 31 Sep 1960, *Foldats 3602* (VEN).

This variation of var. *hispida* has the hairs on the stems, leaves, and calyx gray or white instead of buff, stramineous, or ochroleucous at the base as in typical var. *hispida.* In typical var. *hispida* the hairs on the leaves are weaker, more laxly spreading, and often much sparser.

The holotype has the thickish leaves covered on both sides with rigid short hairs pointing to the apex. In the collection of *Foldats 3602* the leaves have less rigid and longer hairs and the leaves are thinner with 2–4 weak nerves on either side of the midrib. In the holotype collection the leaves have 1–3 strong elevated nerves below.

3g. **Perama galioides** var. **intermedia** Steyerm., var. nov.

A var. *galioides,* var. *longiflora,* et var. *hispida* calycis laciniis valde arcuato-vel erecto-adscendentibus vel arcuato-incurvatis confertis compactis, inflorescentiis 10–15 mm longis 7–10 mm latis recedit; a var. *densipila* pilis brevioribus, calycis laciniis brevioribus, foliis ternatim verticillatis angustioribus praecipue erecto-adscendentibus recedit; caulibus saepe unicapitulatis vel ramosis cum 2–3

capitulis, inferne hirsutulis pilis patentibus 0.5–1 mm longis instructis sat foliosis; foliis plerumque adscendentibus vel erectis vel patentibus, praecipue ternatim verticillatis, lanceolatis vel lineari-lanceolatis vel ovato-lanceolatis 0.75–2.5 mm latis glabratis ciliatis vel parce vel moderatim hispidis pilis 0.7–1.5 mm longis instructis, 3–5-nervatis, nervis subtus omnibus prominenter valdeque elevatis; calycis laciniis 2.5–4 mm longis valde hispido-ciliatis pilis 0.7–1.2 mm longis praeditis; corollis 4–5 mm longis, tubo cum limbo 2.5–4 mm longo, limbo extus puberulo, lobis extus infra apicem setoso-hispidulis; antheris 0.7 mm longis; seminibus 0.8 mm longis 0.5–0.6 mm latis.

Distribution: Gran Sabana of southeastern Venezuela and adjacent British Guiana, generally at elevations between 1100–1600 m.

VENEZUELA. Bolívar: dry sandy and rocky sandstone exposures on level ground adjacent to swamp on plateau-portion of southeast-facing slopes, Ptari-tepui; alt. 1600 m; corolla rich yellow; 1 Nov 1944, *Steyermark 59658* (holotype F, isotype VEN); Uaipán-tepui; alt. 1400 m; 27 Jan. 1948, *K. D. Phelps & C. B. Hitchcock 315* (NY, VEN); Santa Elena, Alto Caroní, 25 Apr 1946, *Lasser 1475* (VEN); Kavanayen; 30 May 1946, *Lasser 1892* (F, NY); Kavanayen; alt. 1220 m; 26 Oct 1944, *Steyermark 59383* (F, NY, VEN); Auyan-tepui; Apr 1956, *Vareschi & Foldats 4730* (NY, VEN); northeast of Luepa; alt. 1220 m; 24–25 Apr 1960, *Steyermark & Nilsson 620* (VEN); Cerro de Auyan-tepui, Sep 1937, *Cardona 227 A* (VEN); Sierra Ichún: tributario del Río Paragua; alt. 500 m; 28 Dec 1961, *Steyermark 90389;* glabrate leaved type growing with no. *90389 A* (NY, VEN); Santa Elena; 15 Feb 1946, *Tamayo 2816* (VEN). BRITISH GUIANA. Small savannal plant in damp places, Chinoweng, *Forest Dept. 7835* (NY).

Somewhat intermediate between the var. *intermedia* and var. *hispida* are the collections of *Vareschi & Foldats 4730*, *Steyermark 90389*, and *Cardona 227 A*, in which the leaves are glabrate or sparsely ciliate or sparsely hispidulous. *Steyermark 59383* intergrades somewhat with var. *densipila*, but the pubescence is shorter and the leaves narrower and more erect-ascending than in var. *densipila*.

3h. **Perama galioides** var. **densipila** Steyermark, var. nov. Fig. 79, E–F.

A var. *galioides*, var. *longiflora*, et var. *hispida* calycis laciniis valde arcuato- vel erecto-adscendentibus vel arcuato-incurvatis confertis compactis, inflorescentiis 5–15 mm longis 7–10 mm latis recedit; a var. *intermedia* pilis longioribus, calycis laciniis longioribus, foliis plerumque quaternatim verticillatis latioribus praecipue patentibus recedit; caulibus vulgo ramosis cum 3–6 ramis inflorescentiisque vel unicapitulis inferne conspicue hirsutulis pilis densis patentibus 1–2 mm longis praeditis sat foliosis; foliis plerumque patentibus vel adscendentibus oliveo-viridibus, praecipue quaternatim verticillatis late lanceolatis, ovato- vel elliptico-lanceolatis vel lineari-lanceolatis, 1–3 mm latis, utrinque dense hirsutulis vel hispidis pilis 1.5–1.75 mm longis praeditis, valde 5-nervatis subtus nervis prominenter valdeque elevatis; calycis laciniis 4–4.5 mm longis valde hispido-ciliatis pilis densis 0.8–1.5 mm longis praeditis; corollis 5–6.5 mm longis, tubo cum limbo 3.5–4 mm longo, limbo extus puberulo, lobis extus infra apicem setoso-hispidulis; antheris 0.7–0.8 mm longis; seminibus 0.7 mm longis 0.5 mm latis.

Distribution. Gran Sabana of southeastern Venezuela at elevations between 300–1100 m.

VENEZUELA. Bolívar: Sabanas de Urimán, en las orillas del Río Caroní; alt. 400 m; 18 Sep 1946, *Cardona 1630* (holotype VEN, isotype NY); Urimán; alt. 300 m; 30 Apr 1953, *Steyermark 75230* (F, NY, VEN); Urimán; Sep 1954, *Bernardi 1676* (NY); Urimán; Aug 1953, *Bernardi 734* (NY); Cerro de Auyantepui, Diciembre 1937, *Cardona 273* (VEN); Cerro Perro, Alto Paragua, Julio 1943, *Cardona 732* (VEN); Cerro de Acurimá, Santa Elena; 30 May 1946, *Lasser 1959* (NY, VEN); Mount Auyan-tepui; alt. 1100 m; Dec 1937–Jan 1938, *Tate 1185* (NY, VEN); between San Rafael and Enemasic; alt. 1200 m; 5 Feb 1952, *Maguire 33168* (NY).

This variation of *P. galioides* is the one having the most densely developed extreme of pubescence. In this variation, the stems and leaves are covered with more numerous hairs which also average longer. The stems are commonly branched with elongated, widely spreading- to arcuate-ascending branches, and are conspicuously foliose with usually spreading or somewhat ascending leaves. The leaves and stems, upon drying, in both var. *densipila* and var. *intermedia,* have a more olive-green color with the hairs more generally yellowish than in the other varieties treated.

As in the other varieties of *P. galioides,* the var. *densipila* intergrades with the other variations. In *Tate 1185* the collection (NY) shows dense pubescence on both leaf surfaces, but in the collection of the same number deposited in VEN, the upper and lower leaf surfaces are only sparsely to moderately pubescent. In *Maguire 33168* there is an admixture in the specimens, some stems and leaves having dense pubescence, others more glabrate.

The holotype of *Mattuschkea galioides* H.B.K., upon which *Perama galioides* (H.B.K.) Poir. is based, was collected by Humboldt and Bonpland "prope Esmeralda in ripa Orinoci fluminis" (Nov. Gen. & Sp. Pl. **2**: 272. 1817). I have examined the holotype of this collection, *Humboldt, Bonpland, & Kunth 1001* (P), and it is apparent, from a study of this specimen and a number of collections cited above from the type locality, that this taxon refers to the plants of Esmeralda having ternate, linear, glabrous leaves, filiform sparsely branched, glabrous to sparsely appressed-pilosulous stems with inflorescences on elongated scape-like peduncles with reduced leaves in the upper portion of the stem. This is the commonest variation in the vicinity of Esmeralda, and is what I have interpreted as *P. galioides* var. *galioides* f. *galioides.*

Although the original description (loc. cit. p. 272) states that the leaves are both "oppositis et ternis," I have seen only ternately verticillate ones. The *Spruce 3236* specimen, cited by Schumann in Martius's Flora Brasiliensis (loc. cit. p. 90), and the holotype specimen have ternate glabrous leaves with short appressed hairs on the stems, and may be taken as typical of the characteristic condition encountered in *P. galioides* var. *galioides* f. *galioides.*

K. Schumann (loc. cit. p. 90) placed *P. stricta* Benth. in synonymy under *P. galioides,* but did not cite nor include the collection of *Schomburgk 100,* upon which *P. stricta* is based. However, as shown under my treatment of *P. hirsuta* in another section of this paper, *P. stricta* Benth. must be considered a variation of *P. hirsuta,* a taxon having opposite leaves in pairs, instead of ternate, as in the *P. galioides* group.

Perama galioides manifests dimorphism of the corollas quite strikingly, and this dimorphism may account for some of the variation exhibited in the collections taken from single populations. In typical *P. galioides* var. *galioides* f. *galioides* both exserted and included anther types as well as both long-exserted and short styles are found among the collections examined. Likewise, in *P. galioides* var.

longiflora and *P. galioides* var. *hispida,* both types of flowers have been found. However, in *P. galioides* var. *densipila* and var. *intermedia* only that type has been found in which the anthers are included and the styles exserted. To a greater extent as well, this latter condition is prevalent in the collections examined of *P. galioides* var. *hispida.*

The *P. galioides* complex is the most polymorphic of any of the specific taxa treated within the genus, as shown by the large number of varieties and forms recognized. Intergradations exist between the various infraspecific taxa and it has been difficult to judge at which levels varietal and formal categories should be drawn. As a whole, the many variations are held together by the 3–4-verticillate leaf arrangement, as opposed to the paired, decussate type found in the *P. hirsuta* complex and in *P. mexiae,* and by the minutely scrobiculate seeds, which contrast with the lineolate type characteristic of all the variations of the *P. hirsuta* group.

The tendency towards two main subspecific categories in *P. galioides* is manifested by the var. *densipila-intermedia* group on the one hand and by the var. *galioides-longiflora-hispida* group on the other. The var. *densipila-intermedia* series is distributed chiefly in the eastern half of the range of *P. galioides,* centering in the Gran Sabana in the state of Bolívar, Venezuela, whereas the var. *galioides-longiflora-hispida* complex is encountered principally in the western half of the geographical distribution, mainly in the upper Río Orinoco and tributaries in the Territorio Federal Amazonas of southwestern Venezuela. The calyx-divisions of the var. *densipila-intermedia* group, which are strongly arched- to erect-ascending with somewhat incurved tips, produce a more tightly compact head than the more loosely spreading and often divaricately spreading to horizontal (especially in the lower part of the head) calyx-divisions of the var. *galioides-longiflora-hispida* series. However, since a number of collections are found which are intermediate between the two main groups, it has seemed best to treat these major variations as distinct varieties rather than as subspecies. In a number of cases (*Cardona 227a, Vareschi & Foldats 4730, Steyermark & Nilsson 620, Forest Dept. 7835,* and various others) it has been difficult to judge into which of the various infraspecific categories certain intermediate collections should be placed, as indicated in the discussions following the treatment of given varieties and forms of *P. galioides.*

4. **Perama mexiae** Standley ex Steyermark, sp. nov. Fig. 81, A–E.

Herba 1.5–4 cm alta annua, caulibus simplicibus erectis adpresso-strigosis monocephalis; foliis oppositis rigidis adscendentibus 3-nervatis sessilibus lineari-lanceolatis apice longe acuminatis vel subulatis 7–9 mm longis 0.8–1 mm latis utrinque glabris, marginibus setoso-ciliatis setis 0.6–1 mm longis instructis, nervis subtus prominentibus; capitulis late oblongis 5–11 mm altis 6–7 mm latis; calyce corollam fere aequanti, tubum corollae aequanti vel longiore quam eum, 4–4.5 mm longo 0.3 mm lato rigide pectinato-ciliato cum 2 setis apicalibus 0.4–0.5 mm longis instructo, ceteris setis lateralibus 0.8–1 mm longis; corolla lutea 5.5 mm longa, infundibuliformi-tubulosa, tubo superne parce graduatimque ampliato 4.25 mm longo basi 0.5 mm lato apice 1 mm lato extus glabro intus infra apicem glabro fauce pilosula, lobis ascendentibus triangulari- vel ovato-lanceolatis acuminatis 1.2 mm longis 0.5 mm latis extus parce breviter hirtellis intus glabris prope basin papillatis; staminibus 0.5 mm exsertis; antheris oblongis subsessilibus in apicem faucis insertis 0.8 mm longis, filamentis subobsoletis 0.1 mm longis; stylis 4.2–4.5

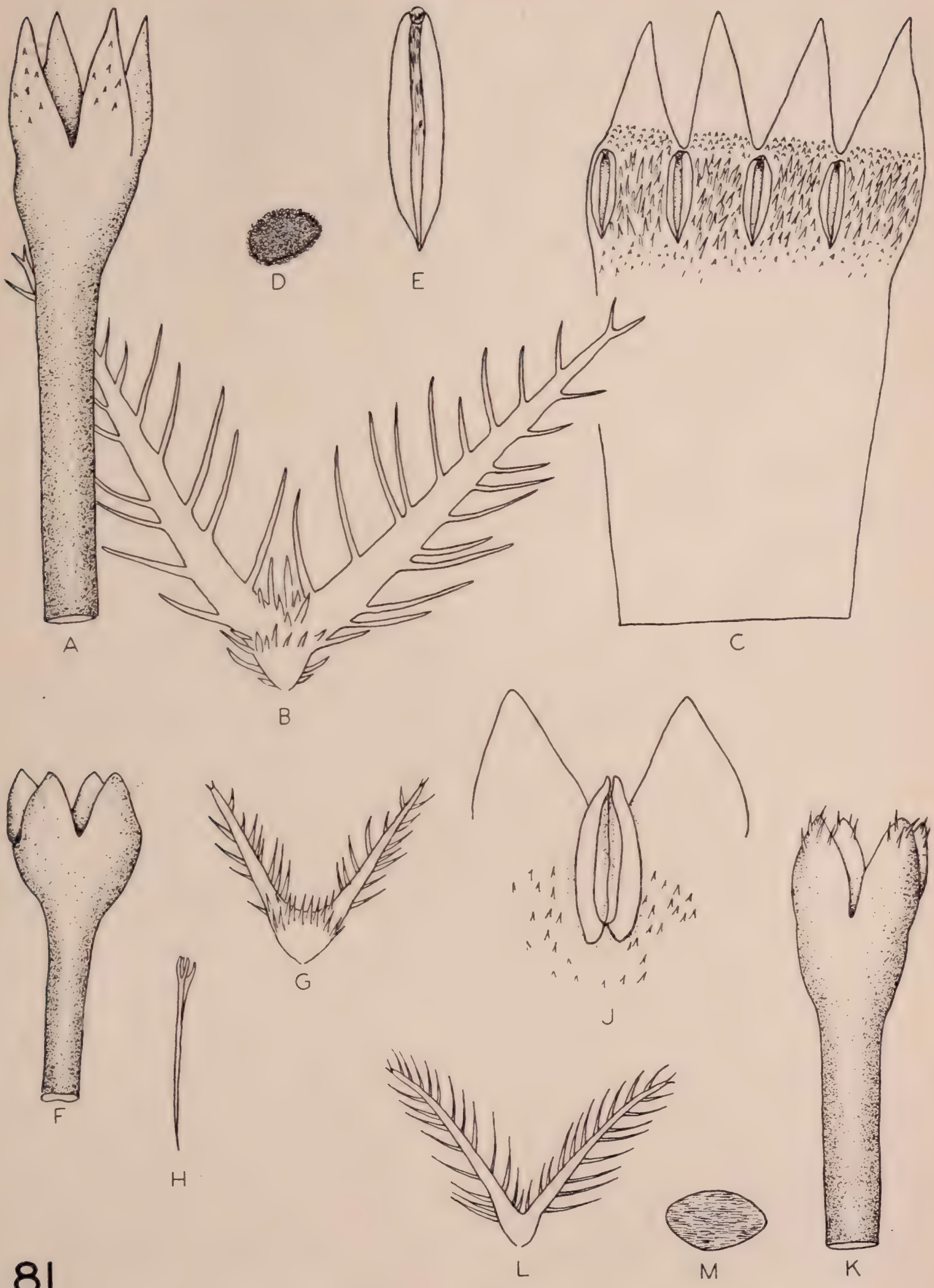


FIG. 81. A–E, *Perama mexiae.* A, corolla, × 15. B, calyx and hypanthium, × 15. C, corolla, spread open, semi-diagrammatic, × 15. D, seed, immature, × 20. E, anther, × 42.5. F–J, *Perama hirsuta* var. *hirsuta.* F, corolla, × 15. G, calyx and hypanthium, × 15. H, portion of style with stigmas, × 15. J, segment of upper part of corolla, showing two lobes and one stamen in position, × 32.5. K–M, *Perama hirsuta* var. *stricta.* K, corolla, × 15. L, calyx and hypanthium, × 15. M, seed, × 25.

mm longis glabris; hypanthio in anthesi obconico 0.5 mm alto; seminibus immaturis rubro-brunneis suborbiculari-ovalibus 0.5 mm longis scrobiculatis.

BRAZIL. Minas Geraes: Diamantina; Olaria; seepage on grass-covered slope; occasional; alt. 1245 m; herb with bright yellow flowers; 14 May 1931, *Ynes Mexia 5837* (holotype NY).

This species is distinguished by the combination of monocephalous stems, which are short and simple, crowded opposite pairs of leaves, calyx equaling the corolla or nearly so, the corolla-tube mostly glabrous within, and the elongate triangular-ovate, acuminate corolla-lobes. The specimen of *Lasser 1892* (NY) approaches this species in habit only. Standley noted on the label of the holotype: "Quite a remarkable plant in a genus in which one would scarcely expect a new species."

5. Perama hirsuta Aubl. Pl. Guian. **1**: 54. *pl. 18.* 1775; Poir. in Lam. Encycl. Suppl. **4**: 353. *pl. 68.* 1816, and **5**: 168. 1804.

Perama setulosa Miq. Linnaea **18**: 617. 1844.
Perama ericoides Poepp. & Endl. Nov. Gen. & Sp. **3**: 29–30. 1845.
Mattuschkea hirsuta (Aubl.) Vahl, Symb. **3**: 11. 1794.
Mattuschkea incana Spreng. Syst. Veg. **1**: 428. 1825; Schult. Mant. **3**: 48. 1827.

Key to the Varieties of *Perama hirsuta*

Hairs on lower portion of stem generally loosely spreading, rarely absent; lower and middle cauline leaves ovate to ovate-lanceolate, mainly rounded at base, mainly 2.5–4.5 mm wide, usually spreading to ascending; stems commonly branched, bearing few, several, or many heads of flowers. 5a. *P. hirsuta* var. *hirsuta.*

Hairs on lower portion of stem appressed or erect-ascending; lower and middle cauline leaves lanceolate, obtuse at base, mainly 0.5–2 mm wide, usually ascending to erect; stems often simple and monocephalous or sparingly branched with few inflorescences. 5b. *P. hirsuta* var. *stricta.*

5a. Perama hirsuta var. **hirsuta.** Fig. 81, F–J.

Perama hirsuta Aubl. Pl. Guian. **1**: 54. *pl. 18.* 1775; Poir. in Lam. Encycl. Suppl. **4**: 353. *pl. 68.* 1816; **5**: 168. 1804.
Perama setulosa Miq. Linnaea **18**: 617. 1844.
Perama ericoides Poepp. & Endl. Nov. Gen. & Sp. **3**: 29–30. 1845.
Mattuschkea hirsuta (Aubl.) Vahl, Symb. **3**: 11. 1794.
Mattuschkea incana Spreng. Syst. Veg. **1**: 428. 1825; Schult. Mant. **3**: 48. 1827.

Distribution. Widely distributed in rocky, especially sandstone, dry or moist savannas, often in wet savannas bordering morichales (*Mauritia*), sandy flats, and along railroads, islands of Trinidad and Martinique, eastern and southern Venezuela, British Guiana, Surinam, and eastern Brazil south to the states of Bahía and Goyaz, at elevations from near sea level ascending to 1250 m on Cerro Moriche in southern Venezuela, and to 1200 m in the Kaieteur Plateau of British Guiana and the summit of Tafelberg, Surinam.

TRINIDAD: Aripo Savanna, 14 Apr 1921, *N. L. & E. G. Britton 2911* (NY); Piarco Savanna, 27 Feb 1920, *N. L. & E. G. Britton & T. E. Hazen 74* (NY); Aripa Savanna, 3 Jul 1962, *Steyermark 90914* (VEN); without locality, 1877–80, *Fendler 991* (NY). MARTINIQUE. Savane seche de Vieux-Fort, îlede Ste. Lucie, 1886, *Pere Duss 1450* (NY). SURINAM. Berlyn, *Wullschlägel 818* (NY); Zanderij I, Oct 1909, *J. Boldingh 3906* (NY); white sand, 21 Mar 1951, *J. & P. A. Florschütz 1882;* savanna, km 116.5, 23 Apr 1949, *J. Lanjouw & J. C. Lindeman 3058* (NY); Zandery, 31 May 1916, *J. A. Samuels 246* (NY); without locality, 1841, *M. Berthoud-Coulon 173* (NY); sandy soil, savanna, vicinity of km 70, 3 Jun 1944, *Maguire & Stahel 23629* (NY, VEN); Savanna II, Sanderij, 3 Jun 1944, *Maguire & Stahel 23692* (NY); Savanna No. 1, Tafelberg (Table Mountain); alt. 1200 m; 3 Aug 1944, *Maguire 24212* (NY, VEN). BRITISH GUIANA. Savannas, Kaieteur Plateau; alt. 1200 m; 1 May 1944, *Maguire & Fanshawe 23129* (NY, VEN); Georgetown, 26 Nov 1919, *A. S. Hitchcock 16947* (NY); frequent in Kopinang Savanna, southern Pakaraima Mountains; alt. 835 m; 5 Sep 1961, *B. & C. K. Maguire & G. Wilson-Browne 46110-A* (NY); Kurupukari, 3 Oct 1937, *A. C. Smith 2173* (NY); *Jenman 2225* (NY). FRENCH GUIANA. "In locis humidis & arenosis Aroura & Orapu, Julio, *F. Aublet*," photo of type of *Perama hirsuta* at Brit. Mus. (NY). VENEZUELA. Anzoategui: Pariaguán, March 1942, *Alicia Hernandez 48* (VEN); Santomé, 21 Aug 1942, *Pittier 15087* (VEN); Santomé, 9 Jun 1941, *Pittier 14778* (VEN). Monagas: Santa Barbara Camp; 4 Nov 1948, *Maguire, Kunhardt, Jr., & Politi 27292* (NY). Bolívar: Altiplanicie de Nuria, 23 Jan 1961, *Steyermark 88714* (NY, VEN); Altiplanicie de Nuria, 23 Jan 1961, *Steyermark 88764* (NY, VEN); Cerro Marimarota, Río Parguaza; 4 Jan 1956, *Wurdack & Monachino 41107* (NY); Gran Sabana, Santa Elena, 3 Oct 1944, *Steyermark 59189* (F, NY, VEN); Alto Paragua, 20 Aug 1943, *Cardona 833* (VEN); Cerro Perro, Alto Paragua, Julio 1943, *Cardona 785* (VEN); El Dorado; alt. 150 m; 14 Apr 1957, *Bernardi 6518* (NY); Sabana de Triana, Río Chicanán, 1 Sep 1961, *Steyermark 89674;* Río Chibau, Río Chicanán, 1 Sep 1962, *Bassett Maguire, Julian A. Steyermark, & Celia K. Maguire 53551* (NY, VEN); Ciudad Piar; Apr 1954, *Aristeguieta 2171* (VEN). Amazonas: East Swamp, Esmeralda; alt. ca. 100 m; 19 Oct 1928, *Tate 266* (F, NY); norte de Merey, cerca del margen del Río Atabapo; Sep 1960, *Foldats 3867* (VEN); Cerro Moriche, Río Ventuari; alt. 1250 m; 15 Jan 1951, *Maguire, Cowan, & Wurdack 30938* (NY). BRAZIL. Para: Santarem, Amazon, *Spruce* (NY); Santarem, Apr 1850, *Spruce 664* (NY); Vigia, 18 Jul 1935, *Drouet 2132* (G, NY, U MO). Terr. do Rio Branco: Serra Tepequem; alt. 900 m; 25 Nov 1954, *B. & C. K. Maguire 40047* (NY); Serra Pellala, Oct 1908, *Ule 7636* (NY). Terr. Amapá: Amapá, 3 Jun 1944, *J. T. Baldwin, Jr. 4069* (NY). Bahia: Serra Morsalina, Carrasco, Jul 1913, *Lützelburg 88* (NY); *Luschnath 75* (P).

5b. Perama hirsuta var. **stricta** (Benth.) Brem. Rec. Trav. Bot. Néerl. **31**: 308. 1934. Fig. 81, K–M.

Perama stricta Benth. in Hook. Jour. Bot. **3**: 239. 1841.

Distribution. Rare and scattered in the range of var. *hirsuta* in British Guiana, southern Venezuela, and eastern Brazil.

BRITISH GUIANA. Sand Creek, Rupununi River, Oct 1948, *WB 280* (NY); savanna, basin of Rupununi River, Wichabai, 26 Oct 1937, *A. C. Smith 2302* (NY); same locality and date, *A. C. Smith 2277* (NY); Waruni-Ituni savannahs, along the Berbice-Rupununi Cattle trail, 20 May 1919, *Abraham 135* (NY); *Schomburgk 100* (isotype of *P. stricta* Benth., NY); Pirara, 1841–2, *Schomburgk 391* (P). VENEZUELA. Bolívar: Camarata; alt. 450 m; Mar 1939, *G. G. Simpson 25* (VEN). Amazonas: Esmeralda, Esmeralda Savana, near Orinoco River; 21 Aug 1944, *Steyermark 57766* (F). BRAZIL. Bahia: 1836, *Blanchet 2424* (NY). Terr. do Rio Branco: Frechal, 5 Sep 1927, *Tate 47* (NY).

The photo of the type collection of *Perama hirsuta* Aubl. shows a taxon with broad ovate, divaricate leaves and this is further emphasized by plate 18 accompanying Aublet's original description. Moreover, Aublet's description of the stems having "villoso" pubescence refers to the type of spreading pubescence characteristic of the lower portion of the stem of *P. hirsuta.* On the other hand, the isotype of *P. stricta* Benth., which I have examined at NY, shows the pubescence on the lower part of the stem appressed to ascending with smaller narrower lanceolate leaves. This taxon (*P. stricta*) tends to have stems less branched and with generally fewer, often solitary heads terminating a stem. However, various intergradations exist between this taxon and typical *P. hirsuta,* for which I have followed Bremekamp's treatment of reduction of *P. stricta* to a varietal category under *P. hirsuta.* K. Schumann (Fl. Bras. **6**(6): 90. 1889) misinterpreted *P. stricta,* placing it as a synonym under *P. galioides,* whereas, because of its opposite pairs of leaves, he should have placed it with *P. hirsuta.* Several collections, such as *Maguire, Cowan, & Wurdack 30938, Britton & Britton 2911, Fendler 991, Britton, Britton, & Hazen 74, Baldwin, Jr. 4069, Ule 7636, Cardona 785,* and *Duss 1450,* are somewhat intermediate in approaching the habit and in showing the tendency toward reduced leaves of var. *stricta,* but have been placed with var. *hirsuta* because of the spreading pubescence of the lower part of the stem, together with subovate spreading leaves.

In general the lower half of the stems is covered with spreading hairs in *P. hirsuta* var. *hirsuta,* but rarely have few hairs, becoming almost glabrate as in the collections of *A. C. Smith 2173* from British Guiana and *Coulon 173* from Surinam. These collections, likewise, show leaves wholly or mainly without the characteristic pubescence present in most specimens of *P. hirsuta* var. *hirsuta* or var. *stricta.* This tendency towards a glabrate-leaved condition is also exhibited by *Ule 7636, Cardona 833,* and *Samuels 246.* As there are varying degrees in the amount of foliar pubescence present which do not appear to be correlated, and as the reduction of hairs may possibly be correlated with age and maturity of the plant, no separate category has at the present time been given for the specimens with the glabrate-leaved tendency.

Some authors (Schumann, Standley) have considered *Mattuschkea hispida* H.B.K. as synonymous with *Perama hirsuta.* However, as is shown under my treatment of *P. galioides* (H.B.K.) Poir., Humboldt & Bonpland's *M. hispida* refers to a plant with the ternate-leaved condition characteristic of the *P. galioides* group, rather than to leaves decussate in pairs, as characterizing the *P. hirsuta* group.

6. **Perama vellerea** K. Sch. Bull. Soc. Bot. France **56** (Mem. **3d**): 364. 1907.

Distribution. Known only from Minas Geraes, Brazil.

BRAZIL. Minas Geraes: Serra do Cipo, *Glaziou 19462* (holotype P, photo of type from B in F and NY); same locality, *Glaziou 19463* (P).

This species is doubtfully included in the genus *Perama.* It differs from the other species of the genus in having 5 instead of 4 corolla-lobes, 5 instead of 4 stamens, strigose anther cells densely barbate at base, rose-colored corollas, and flowers solitary in the upper leaf-axils.

Platycarpum Humb. & Bonpl. Pl. Aequin. **2**: 81. *t. 104.* 1809.

At the time I treated the known species of this genus (Am. Jour. Bot. **39**: 418–423. 1952) five specific taxa were indicated. In 1957 Bremekamp added a sixth species, *P. froesii,* from Brazil (Meded. Bot. Mus. Herb. Rijks. Utrecht **141**: 374–375. 1957). In this last paper he erects for *Platycarpum,* along with

Henriquezia, a separate family, *Henriqueziaceae*, which he distinguishes from the Rubiaceae by the exalbuminous seeds, peculiar petiolar glands, absence of colleters on the inside of the stipules, zygomorphous androecium, and large size of the cotyledons in comparison with the axial part. According to Bremekamp, the genus *Gleasonia* is the only genus of Rubiaceae possessing cotyledons of large size in comparison with the axial part. Whether or not these ''petiolar glands'' are unique in the flowering plants, as indicated by Bremekamp (loc. cit. p. 353), I cannot be positive, but it is probable that they appear elsewhere among other families of flowering plants.

For the present, I am retaining *Platycarpum* and *Henriquezia* in the Rubiaceae, along with *Gleasonia*. The following revised treatment of *Platycarpum* is based upon a study of newly available material which Bassett Maguire has kindly placed at my command. These recent collections have resulted from various expeditions made by The New York Botanical Garden to portions of the Guayana Shield. Together with recent collections made by Sven Nilsson with me, they form the basis for the newly described taxa herewith presented, as well as for the emendations and supplementary notes on species previously described. In connection with this material, the ''petiolar gland'' has been found to be of some significance, even to the extent of the partial delimitation of species.

The genus, as at present constituted, is now known, largely from Venezuela, to extend from British Guiana (Mount Ayanganna) on the east, to the Vaupés River area of southeastern Colombia on the west, and southward into the Rio Negro drainage in the state of Amazonas of northern Brazil. In the Venezuelan area a large number of gaps are to be noted in the geographical distribution of the genus, but these eventually may be filled with future exploration. In the western and southern portions of its range, the species occupy lowland habitats along the streams from 100–800 m elevation above sea level, often at the base of such cerros as Yutaje and Moriche, or on the slope forest of Cerro Neblina, but at its eastern limits ascending to higher altitudes of the sandstone plateau of the Cerro Venamo area at 1300 m or on Mount Ayanganna in British Guiana at an elevation of 1000 m.

Altogether ten species, of which four are presented as new, and one new variety, are given in the following treatment.

Key to the Species of *Platycarpum*

1. Leaves in 3's.
    2. Petiolar gland absent or not evident; lower surface of leaf-blades with soft dense pubescence of hairs up to 2 mm or more long. 10. *P. eglandulosum.*
    2. Petiolar gland evident; lower surface (excluding midrib and lateral nerves) of leaf-blades either glabrous, glabrate, or with short hairs 1 mm or less long.
        3. Petiole 2–4 mm long; lower surface of leaf-blades conspicuously pubescent; plants of Amazonas, Brazil, and southeastern Colombia.
            4. Petiolar gland quadrate; leaves rounded at apex, the blades 6.5–8.5 cm long; lateral nerves of leaf-blades not prominently elevated beneath; peduncle not pluricostate. 1. *P. froesii.*
            4. Petiolar gland shallowly semi-lunulate; leaves subacute at apex, the blades 6.5–14 cm long; lateral nerves of leaf-blades prominently elevated beneath; peduncle pluricostate. 2. *P. schultesii.*
        3. Petiole 7–15 mm long; lower surface (excluding midrib and lateral nerves) of leaf-blades glabrous or sparsely puberulent; plants of Estado Bolívar, Venezuela.
            5. Midrib and lateral nerves of lower side of leaf-blade glabrous or nearly so; lower surface of leaf-blade glaucous or glaucescent; petiolar gland 1,

occurring at very base and on lower side of petiole, 2–4 mm long; mature capsule 2.5–3 cm long (high), 3.5–4 cm wide; seeds 2.7–3 cm long, 1.5–2 cm broad; outer surface of capsule finely verruculose-rugulose. 8. *P. rhododactylum.*
    5. Midrib and lateral nerves of lower side of leaf-blade strigose; lower surface of leaf-blade not glaucous; petiolar glands usually 3, two occurring laterally and/or one at the base of the lower side of petiole, 1 mm long; mature capsule 4.2–5 cm long (high), 5–6 cm wide; seeds 4.2–4.8 cm long, 2.5 cm wide; outer surface of capsule conspicuously areolate-rugose. 9. *P. rugosum.*
1. Leaves opposite, in pairs.
  6. Upper as well as lower surface of leaf-blades glabrous. 7. *P. negrense.*
  6. At least the upper surface of leaf-blades scabridulous or more conspicuously pubescent.
    7. Lower surface of leaf-blades glaucous or whitened, glabrous or sparsely or minutely puberulous; petiole glabrous or sparsely pubescent; corolla-lobes mainly acute to subobtuse.
      8. Corolla 26–27 mm long (20–22 in dried state); corolla-lobes 6–8 mm wide, ⅓–½ length of corolla; inflorescence 3–8 cm broad, 2½–3 times as long as broad; lower main lateral branches of inflorescence 3.5–4 cm long, upper ones 1.5–2 cm long; lateral branches and ultimate pedicels of inflorescence rufous-hirsute. 5. *P. maguirei.*
      8. Corolla 21–23 mm long (18–20 mm in dried state); corolla-lobes 5–6 mm wide, mostly ½ or more the length of corolla; inflorescence 8–17 cm broad, as broad as or broader than long to at most 1½ times as long as broad; lower main lateral branches of inflorescence 4.5–6 cm long, upper ones 2.5–3 cm long; lateral branches and ultimate pedicels of inflorescence cinereous-strigillose. 6. *P. decipiens.*
    7. Lower surface of leaf-blades more or less conspicuously pubescent; petioles manifestly pubescent; corolla-lobes mainly rounded to more rarely acute.
      9. Peduncle densely tomentose or tomentulose; corolla 17–24 mm long; mature fruiting capsule as broad as or broader than long (high), 3–3.5 cm long, 3.5–4 cm broad; anther 3.4–4 mm long; style 8.5–11 mm long; leaf-blade rounded at apex. 4. *P. orinocense.*
      9. Peduncle rufous-villous with conspicuously spreading hairs; corolla 14–16 mm long; mature fruiting capsule longer (higher) than broad, 4.5–5 cm long, 3.5–4 cm broad; anther 4.25–4.5 mm long; style 5–6.5 mm long; leaf-blade subobtuse or obtusely acute at apex. 3. *P. duckei.*

1. **Platycarpum froesii** Bremekamp, Meded. Bot. Mus. Herb. Rijks. Utrecht **141**: 374–5. 1957.

2. **Platycarpum schultesii** Steyermark, Bot. Mus. Leafl. **17**: 96. 1955.

Distribution. Southeastern Colombia, where known only from a tributary of the Río Vaupés.

COLOMBIA. Vaupés: Río Paraná Pichuna (tributary of Río Vaupés), lat. 1° 10′ N, Long. 70° 30′ W; alt. 220 m; bush; flowers pink; Jun 1953, *Richard Evans Schultes & Isidro Cabrera 19929* (holotype F, isotype US).

In the shallowly semi-lunulate gland of the petiole, this species resembles *P. decipiens* and *P. orinocense*. From the former it is at once distinguished by the ternate leaves with their densely pubescent non-glaucous lower surface, while from *P. orinocense* it is separated by the ternate leaves rounded at apex with shorter hairs on the lateral nerves and midrib of the lower side of the blade, and by the shorter and sparser pubescence of the peduncle. It is apparently most closely related to *P. froesii* of Brazil, from which it differs in the semi-lunulate instead of quadrate petiolar gland, longer, subacute leaves with denser pubescence beneath, more numerous lateral nerves more prominently elevated beneath, and by the pluricostate villosulous peduncle.

3. **Platycarpum duckei** Steyermark, Am. Jour. Bot. **39**: 422. 1952.

The following details may be added to the original description:

Petiolar gland on lower side of petiole at base, 1–1.5 mm broad, 4–5 mm long, not curved or bent; calyx 9–10 mm long, the calyx-tube 2–4 mm long; fruiting capsule oval-oblong, longer than broad, 4.5–5 cm long, 3.5–4 cm broad, the valves about 1 mm thick. Additional specimens examined: BRAZIL. Amazonas: Borba (Rio Madeira), silva paludosa terris altis; arbor magna; 9 Nov 1935, *Ducke 237* (NY).

4. **Platycarpum orinocense** Humb. & Bonpl. var. **orinocense**

The following details may be added to the description previously published in Am. Jour. Bot. **39**: 421–22. 1952:

Stipule at very summit of leafy branch (good one seen on specimen of *Maguire & Maguire 35046* from Cerro Yutaje), linear-lanceolate, obtuse at apex, (5–)8–8.5(–10) cm long, 1.3–1.5 cm wide, tawny densely sericeous, densely buff-stramineous sericeous within, villous without, other stipules caducous; mature capsule 3.5–4 cm broad; seed sublunar-oblong, convex on one edge, subtruncate on other, 3.5 cm long, 1.7–2 cm high, the body chestnut or rufous-brown, the body proper 1.5–2 cm long, 0.7–1 cm high, wing 6 mm broad with a blackish band 1.5–2 mm broad bordering edge and 1.5–2 mm from edge.

Additional specimens examined: VENEZUELA. Amazonas: occasional in scrub forest bordering crystalline laja, Puerto Ayacucho; alt. 100–120 m; tree to 15 m; flowers 5-merous, slightly zygomorphic; pubescence tawny; corolla lobes white apically, red basally, the lowermost segment with yellow bearding; 8 Nov 1953, *Maguire, Wurdack, & Bunting 36063* (NY); Cerro Moriche, Río Ventuari; tree 10 m; stipules early caducous, 5–10 cm long; flowers irregular, 4–5-merous; sepals white; 2–3 petals white with basal red streaks; 1–2 petals white with basal yellow streaks; 13 Jan 1951, *Maguire, Cowan, & Wurdack 30850* (NY); Cerro Moriche, Río Ventuari; 14 Jan 1951, *Maguire, Cowan, & Wurdack 30877* (NY); Cerro Yutaje, Río Manapiare; dominant tree of savanna 1 km east of Base Camp; alt. 150 m; tree to 20 m high × 2 dm diam; 30 Jan 1953, *B. & C. K. Maguire 35046* (NY); occasional around rock outcrops at Sanariapo; 24 Apr 1953, *Maguire & Wurdack 35736* (NY); Sabana Huachapana; 15 Sep 1957, *Maguire, Wurdack, & Keith 41463* (NY); Savanna Huachapana, 30 km above Santa Barbara; 18 Jan 1958, *B. & C. K. Maguire, Wurdack, & Keith 42655* (NY); Puerto Ayacucho, Mar 1950, *Curran 1789* (VEN); bords de l'Orenoque, 1887, *Gaillard 204* (photo of topotype from P at F); savanna hills southeast Guanay; 27 Jan 1951, *Maguire, Cowan, & Wurdack 31617* (NY).

The specimen of *Maguire, Cowan, & Wurdack 30877* has some of the flowers with four calyx-lobes, but most of them have five calyx-lobes. Other variations noted in flowering material are found in the specimens of *Maguire, Wurdack, & Bunting 36063* taken near the type locality of Puerto Ayacucho. This collection has smaller flowers than average, 17–19 mm long with lobes 7–10 mm long and 5.5–6 mm wide, but also shows large flowers up to 24 mm long with corolla-lobes 8–10 mm long and 6–9 mm wide. In this collection the calyx-lobes vary from 5 to 6 on the same inflorescence with variability from 3 to 1 mm wide on the same flower and from 8–8.5 mm long to 9 mm long and 7 mm wide.

A marked variation of *Platycarpum orinocense* from the base of Cerro Parú is herewith described:

4b. Platycarpum orinocense var. **grandiflorum** Steyermark, var. nov.

Arbor 2–10 m, ramis novellis ferrugineo-hirsutis; foliis oppositis coriaceis obovato-oblongis vel obovatis apice rotundatis basi in petiolum 11–15 mm longum brunneo-hirsutum cuneatim angustatis 14–23 cm longis 8–11 cm latis supra aspero-hirsutulis subtus molliter villosis pilis 2–3 mm fulvis vestitis, nervis lateralibus utroque latere 14–18; petioli una glandula subreniformi ventraliter inserta; thyrsis terminalibus 15 cm longis 15 cm latis, pedunculo 3.5–6 cm longo ferrugineo-hirsuto elevato, rhachi ramulis secundariisque ferrugineo-hirsutis vel tomentosis; pedicellis 5–12 mm longis ferrugineo-hirsutis vel tomentosis; calyce 4–5-mero 11–13.5 mm longo, tubo (hypanthio) 1.5 mm alto 4 mm lato ferrugineo-hirsutulo, lobis 4–5 oblongo-lanceolatis subacutis 10–12 mm longis 4.5–6 mm latis extus tomentoso-hirsutulis pilis fulvis instructis intus dense sericeo-strigosis pilis pallidioribus brunneis vestitis; corollis campanulato-infundibuliformibus albis basilariter rufotinctis maculatisque (teste *Cowan & Wurdack*) 25 mm longis, tubo 4 mm longo intus glabro usque 2.5–3 mm longo fauce dense barbata superne ampliata 13–14 mm longa, lobis 5 inaequalibus, uno lobo vel duobus lobis albis parte media pilis luteis vestita basilariter rufotinctis maculatisque instructis (teste *Cowan & Wurdack*), oblongo-ovatis apice abruptis acutis interdum rotundatis 10–11 mm longis 8–10 mm latis uno lobo vel interdum duobus lobis intus luteo-villosis ceteris glabris; filamento 7.5–9 mm longo; capsula ignota.

Distribution. Known only from Serranía Parú, Territorio Federal Amazonas, Venezuela.

VENEZUELA. Amazonas: frequent in savanna at west base of Cerro Parú, Serranía Parú, alt. 200 m; tree 2–10 m; 3–4 petals white with red streaks and blotches basally; 1–2 petals white with red streaks and blotches basally but irregular with central yellow hairs; 15 Feb 1951, *Cowan & Wurdack 31473* (holotype NY).

This variation of *P. orinocense*, known thus far only from the Cerro Parú, differs from the more widespread *P. orinocense* var. *orinocense* in the larger calyx and corolla, longer filaments, ferruginous-hirsutulous peduncle and branches of inflorescence, more conspicuously pubescent lower surface of the leaf-blades with buff-tawny hairs 2–3 mm long instead of whitish and less conspicuous hairs 0.5–1.5 mm long of var. *orinocense*, and more densely pubescent upper leaf surfaces with hairs 0.2–2 mm long instead of all short-pustulate based hairs 0.1–0.5 mm long of var. *orinocense*. Most of the corolla-lobes in var. *grandiflorum* are abruptly acute as contrasted with rounded in var. *orinocense*, but the fifth lobe in var. *grandiflorum* may be rounded, and there is some transition in this character, thus breaking down the differences that might otherwise exist between the two varieties. Rarely two lobes, instead of the usual one, of a corolla are encountered having the inner surface densely yellow-bearded down the central portion continuing to the base of the limb. If this were of constant occurrence, it would constitute a specific character, but examination of the holotype collections shows that the bearded condition may occur on one or two lobes, and is not constant.

While the differences separating var. *grandiflorum* from var. *orinocense* appear to be of specific character at first, variation noted in some collections of var. *orinocense* in corolla size break down some of the apparent differences. Thus, in *Maguire, Wurdack, & Bunting 36063*, for example, taken near the type locality of Puerto Ayacucho (near rapids of Ature), some corollas are small, measuring 17–19 mm long with corolla-lobes 5.5–6 mm wide, others are large, measuring 24 mm long with lobes 6–9 mm wide; also, in this collection the calyx-lobes vary on the same inflorescence from 1–7 mm wide. There is also some variability, among the suite of specimens examined in var. *orinocense,* in the amount and density of pubescence on the lower leaf-surface and in the inflorescence branches. It appears at this time, therefore, better to consider the present newly described taxon in a varietal instead of specific category, allowing for the possibilities of future collections to furnish data for a more definite commitment as to status.

5. **Platycarpum maguirei** Steyermark, sp. nov. Fig. 76, I–J.

Arbor alta ad 25 m, ramulis novellis glabris; stipulis caducis; foliis oppositis coriaceis anguste ellipticis vel elliptico-oblanceolatis apice obtuse acutis vel obtusis basi acutis in petiolum 12–23 mm longum glabrum vel parce adpresso-pilosum cuneatim angustatis 11–25 mm longis 3–7 cm latis, supra manifeste aspero-scabridulis subtus glauco-pallidis costa media nervis lateralibusque parce strigillosis ceterum venulis minutissime strigillosis vel glabrescentibus, nervis lateralibus utroque latere 15–19 adscendentibus in sicco glauco-purpureis costa media paullo elevatis; petioli una glandula V- vel U-forma 0.6–1 mm lata quoque latere 2–3 mm longo ventraliter inserta; thyrsis terminalibus 10–27-floris 8–15 cm longis 3–8 cm latis 2½–3-plo longioribus quam latioribus pedunculo 1.5–4 cm longo glabro glauco elevatis, ramulis secundariis ferrugineo-hirsutis superioribus 1.5–2 cm longis infimis 3.5–4 cm longis, rhachi in parte inferiore glauca glabra in parte superiore ferrugineo-hirsuta, nodis inferioribus foliis ordinariis vel magnitudine aliquantulo redactis suffultis, ramulis superioribus pedicellisque bracteatis, bracteis subulatis vel linearibus 3–10 mm longis ferrugineo-hirsutis mox caducis; pedicellis 4–13 mm longis dense ferrugineo-hirsutis; calyce 5-mero 10–12.5 mm longo, tubo (hypanthio) campanulato 2.5 mm longo (alto) 6 mm lato cinereo-tomentuloso pilis hirsutis ferrugineis vestito, lobis 5 subaequalibus oblongo-lanceolatis subacutis 9–10 mm longis 3–4 mm latis intus sericeis extus tomentulosis pilis ferrugineis strigosis vestitis; corollis infundibuliformibus albis tubo intus rufotincto notato uno lobo luteo (teste *Maguire*) 26–27 mm longis (in sicco 20–25 mm) extus dense sericeis, tubo 5 mm longo 6 mm lato intus glabro usque 2–3 mm longo fauce dense barbata superne ampliata 9–11 mm longa supra 15–17 mm lata, lobis 5 inaequalibus oblongo-obovatis acutis vel subacutis quatuor 8–14 mm longis 6–8 mm latis 1/3–1/2 longitudinem corollae aequantibus intus glabris quinto 13–17 mm longo 6–8 mm lato intus parte media luteo-pubescenti marginibus glabris exceptis; staminibus 5, duobus paullo brevioribus; staminum antheris lineari-oblongis 3.8–4 mm longis 0.8–0.9 mm latis prominenter apiculatis; filamentis glabris 5–6.5 mm longis; ovario 2.5 mm alto apice hirsutis pilis erectis dense vestito margine corona instructo; stylo 7.5 mm longo glabro; stigmate 2-fido ovato-oblongo obtuso; capsula ignota.

Distribution. Extreme southern Venezuela in Territorio Federal Amazonas, where known only from Cerro de la Neblina.

VENEZUELA. Amazonas: Cerro Neblina, slope forest between camp 2 and camp 3; alt. 130–700 m; 5 Jan 1958, *B. Maguire, C. K. Maguire, Wurdack, & Keith, Jr. 42597* (holotype NY).

This species is most closely related to *P. decipiens* Woodson & Steyerm. of the Río Negro-Río Guainia area, from which it is most readily distinguished by the generally larger corolla with broader, relatively shorter lobes, more spreading rufous pubescence of the upper branches and pedicels of the inflorescence, and relatively narrower inflorescence with shorter lateral branches.

6. **Platycarpum decipiens** Woodson & Steyermark, Am. Jour. Bot. **39**: 422. 1952. Fig. 76, D–H.

At the time of publication of the original description of this species, no calyx or corolla was available for study. The excellent flowering material, recently collected by *Wurdack & Adderley 43226*, furnishes the following emended description to be added to the original publication.

Petioles 1–2 cm long; gland at base of petiole semi-lunar, 1–1.25 mm long; leaf-blades 2.5–4.7 cm wide; lateral pairs of nerves 11–16; inflorescence 9–17 cm long, slightly longer than broad to 1½ times as broad as long or as broad or broader than long, upper secondary lateral branches of the peduncle 2.5–3 cm long, lower ones 4.5–6 cm long, 15–42-flowered, lateral secondary branches (except the lowest) and ultimate pedicels cinereous-strigillose with sparse to moderate ascending-spreading rufous hirtellous pubescence; lower half of main central peduncle glabrous and glaucous, as are sometimes also the lowest lateral secondary branches; calyx-lobes 5, subequal, sericeous within, tomentose without with strigose hairs; corolla somewhat zygomorphic, white, inside crimson-streaked with one yellow lobe (teste *Wurdack & Adderley*), the one yellow lobe densely tomentose within, the other four lobes glabrous within, densely barbate zone at base of swollen and enlarged filaments; corolla 21–23 mm long, tube 4 mm long, glabrous within at very base, enlarged abruptly above the tube to a spreading limb 6–12 mm long, 15–17 mm broad at orifice, densely buff-strigose or sericeous without; corolla-lobes slightly less than one-half to slightly more than one-half length of corolla, one of them tomentose within cut usually more deeply along one side (up to 16 mm long) while 12–13 mm long on other side, the other four lobes more or less similar and cut to 9–13 mm long, the lobes mainly 5–6 mm wide, subacute or subobtuse; stamens 5, somewhat unequal, three generally slightly higher than the other two; filaments curved, glabrous, swollen or enlarged at very base, 6.5–8 mm long; anthers versatile, glabrous, 4 mm long with prominent obtuse appendage protruding at apex; shortest two stamens present generally on either side of the lobe which is densely tomentose within.

Additional specimens examined: VENEZUELA. Amazonas: *Williams 14587* (isotype VEN); Caño San Miguel just above Limoncito 15 km from Río Guainia; corolla white, inside crimson streaked with one yellow lobe; 28 Jun 1959, *Wurdack & Adderley 43226* (NY).

At the time of the original description, this species was thought to have the largest fruits in the genus. Its measurements are now exceeded by those of other species.

7. **Platycarpum negrense** Ducke, Arquiv. Inst. Biol. Veg. Rio de Janeiro **1**: 212. 1935.

8. **Platycarpum rhododactylum** Woodson & Steyermark, Am. Jour. Bot. **39**: 423. 1952.

Examination of additional material makes it necessary to emend the original description as follows:

Leaf-blades 3–12 cm wide, broadly ovate to ovate-elliptic or oblong-elliptic; petiolar gland at very base of petiole on lower side, slightly narrowed at each end but mostly oblong, 2–4 mm long, 1.2–2 mm high; inflorescence condensed, 5–7 cm long, 4.5–6 cm broad, peduncle suppressed or the first elongated node

3–6.5 cm long; calyx-tube 2–3 mm long, calyx-lobes 5–8 mm long, 3–4 mm wide; corolla-tube 11–13 mm long; corolla-lobes 3–5 mm long; capsule 3.5–4 cm broad, 2.5–3 cm long, broader than long; seed suborbicular-ovate, broadly winged, 2.7–3 cm long, 1.5–2 cm broad, the central body olive-brown, 1.2–1.5 cm long, 1–1.1 cm high, the winged portion 3–7 mm wide and rufous-brown, the testa conspicuously and densely papillate.

Additional specimens examined: VENEZUELA. Bolívar: abundante al norte del Salto Hacha, Canaima; arbusto 5 m alto; zona rocosa; Agosto 1957, *Blohm 1* (VEN); cumbre de cerro arenisco Cucurital, Alto Caroní; arbusto de 6 m; 24 Feb 1953, *Cardona 2825* (NY, VEN); *Cardona 856, 860* (NY, VEN).

9. **Platycarpum rugosum** Steyermark, sp. nov.

Arbor 8–15 m, ramulis novellis strigosis vel hirsutis; stipulis caducis calyptriformibus, supremis 2.5–5 cm longis hirsutis; foliis plerumque ternatis erecto-adscendentibus coriaceis petiolatis, laminis ellipticis vel late oblongis apice obtusis rotundatis vel obtuse acutis basi acutis vel obtusis in petiolum 7–11 mm longum strigosum cuneatim angustatis 11–20 cm longis 4–9 cm latis, supra costa media nervis lateralibusque strigosis aliter fere glabris vel leviter scabridulis vel strigosis, subtus praecipue costa media nervis lateralibusque necnon inter nervos valde strigosis pilis ad 2 mm longis venularum reticulo minutissime albopuncticulato inter reticulum glabris, nervis lateralibus utroque latere 11–16 eis et costa media elevatis; petioli plerumque tribus glandulis lateraliter et basilariter insertis duobus lateralibus ellipticis utrinque rotundatis vel subrotundatis glabris 1.5–2.5 mm altis 0.75–1.5 mm latis, glandula basilari ventrali inserta lineari-fusiformi 2.5–3 mm longa 0.5 mm alta; thyrsis terminalibus contractis crebre densifloris ut videtur 2–4 cm altis 3–3.5 cm latis hirsutis; floribus brevipedicellatis; calyce 5-mero 9 mm longo, tubo (hypanthio) campanulato-turbinato 3–3.5 mm longo (alto) 4 mm lato ferrugineo-strigoso vel -hirsuto vetustiore canostrigoso, lobis 5 subaequalibus ovatis vel ovato-lanceolatis subacutis 4–5 mm longis 3 mm latis intus stramineo-sericeis extus dense strigoso-hirsutis; corollis ut videtur parvis subcampanulato-infundibuliformibus ut videtur extus ferrugineis intus brunneis atropurpureo-striatis marginibus griseis 9 mm longis extus dense strigosis, tubo 5 mm longo in parte inferiore 4 mm lato intus in parte basilari glabro usque 1.5 mm longo supra basin dense barbato-hirsuto, lobis 5 late ovatis acutis 4–4.5 mm longis 3 mm latis quinto intus breviter pubescenti ceteris intus glabris; staminibus 5; staminum antheris ovoideo-oblongis apice acutiusculis 2.5 mm longis 1 mm latis; filamentis 3 mm longis basi dense barbato-hirsutis superne parce puberulis; ovario apice hirsuto pilis erectis stramineo-fulvis vestito corona annulari 1.5–2 mm alta instructo; stylo 4 mm longo glabro; stigmate 2-fido intus papillato; capsulis compressis rotundato-obreniformibus 5–6 cm altis valvis 4 mericarpiis lignosis 2–2.5 mm crassis extus ferrugineis vel atropurpureis vel atrobrunneis manifeste rugosis areolatisque, minutissime tomentulosis; seminibus maturis in quoque loculo 2 elliptico-sublunatis 4.2–4.8 cm longis ca. 2.5 cm latis (altis) alatis, alis pallido-brunneis 2–13 mm latis corpusculo fusco vel griseobrunneo 25–30 mm longo 18–20 mm lato (alto), testa dense prominenter papillata.

Distribution. Southeastern Venezuela, Estado Bolívar, where known only from summit of Uei-tepui and vicinity.

VENEZUELA. Bolívar: dominant in dwarf forest in depressed portion, summit of Uei-tepui, northwest of km 125 south of El Dorado; alt. 1340 m; common tree 8–15 m tall; calyx ferruginous-strigose; corolla ferruginous-strigose on outside with grayish margins, inside brown with dark purple-blackish streaks, margined gray; anthers grayish-brown; 7 Mar 1962, *J. A. Steyermark & L. Aristeguieta 25* (holotype VEN, isotype NY); same locality; leaves mostly in 3's; tree 15 m; leaves erect-ascending, coriaceous, deep green above with midrib and nerves raised above; 19 Apr 1960, *Steyermark & Nilsson 326* (paratype NY, Upssala, VEN); vicinity of km 131–132, in dwarf forest on summit of plateau in sandstone soil, between Luepa and Cerro Venamo; alt. 1300 m; 10 Mar 1962, *Steyermark & Aristeguieta 92* (paratype NY, VEN).

This species, and the newly described *P. eglandulosum* Steyerm. of British Guiana, possess the largest capsules and seeds thus far known of any of the species of *Platycarpum*. Although resembling the size and shape of the fruits of *P. eglandulosum, P. rugosum* has the outer surface of the pericarp more conspicuously areolate-rugose with large areoles, whereas in *P. eglandulosum* the outer surface of the pericarp is more finely areolate with the areolations less prominent. Moreover, the lower leaf surface of *P. eglandulosum* has a different type of pubescence, this being of a dual nature consisting of a soft, dense, villous type covering a minutely tomentulose surface in the reticula between the veins, whereas in *P. rugosum* the pubescence consists of just one type of long strigose hairs, the reticula between the veins lacking the tomentulose vestiture but with a glabrous surface minutely white-puncticulate. The upper surface of the leaf-blade in *P. rugosum* is glabrous or sparingly strigose or scabro-puberulent, but in *P. eglandulosum* is more densely pilose.

The petiolar glands in *P. rugosum* are peculiar for the genus. Instead of the occurrence of one gland at or near the base of the ventral side of the petiole, the more usual condition found, there are instead two small glands attached laterally on the petiole 2–4.5 mm above its base in addition to the usual single gland found at the very base of the petiole. Thus, three glands may be present and associated with each petiole in this species.

Although dozens of trees were observed in fruiting stage at the time of the second visit to the area, only a few possessed inflorescences. In those trees where some inflorescences were still extant, all flowers were small, in fact, the smallest size of any species of the genus. Whether this is a normal condition, or rather represents late or aborted stages of flowering, can be decided only by future collections taken in full anthesis. In the short, contracted type of inflorescence which it possesses, *P. rugosum* suggests *P. rhododactylum*, a species having 4 instead of 5 calyx-lobes, smaller fruits, and glaucous or glaucescent nearly glabrous lower leaf surfaces.

10. **Platycarpum eglandulosum** Steyermark, sp. nov.

Arbor 15–20 m; ramulis novellis hirsutulis; foliis ternatis coriaceis petiolatis, laminis ellipticis vel elliptico-oblanceolatis apice obtusis vel subacutis in petiolum 2–8 mm longum brunneo-hirsutulum cuneatim angustatis, 10–19.5 cm longis 3–6.5 cm latis, supra scabrido-pilosis pilis pallidis, subtus pallidioribus conspicue molliter villosis pilis brunneis vel pallidis vetustioribus magis parce pilosis venularum reticulo minutissime dense albo-tomentello inter reticulum, nervis lateralibus utroque latere 17–21 eis et costa media elevatis; petioli glandulis nullis vel obsoletis; floribus ignotis; capsulis compressis rotundato-obreniformibus 4.5–5.5 cm latis 3.8–4.7 cm altis, valvis 4 mericarpiis lignosis 1.5–2 mm crassis extus ferrugineis vel fuscis areolatis minute tomentulosis; seminibus maturis in quoque loculo 2 elliptico-sublunatis 4.2–4.8 cm longis ca. 2.5 cm latis (altis) alatis, alis brunneis 2.7 mm latis corpusculo ferrugineo 30–35 mm longo 18 mm lato (alto), testa dense conspicue papillata.

Distribution. Known only from Mount Ayanganna, British Guiana.

BRITISH GUIANA. Frequent in woodland between Chinowieng and Chi-Chi landing, Mount Ayanganna, Pakaraima Mountains; alt. 1000 m; tree 15–20 m tall with flaking bark; leaves pale beneath; 10 Feb 1955, *B. Maguire, W. M. C. Bagshaw, and C. K. Maguire 40666* (holotype NY, isotype VEN).

This species marks the most easterly limit of the genus *Platycarpum,* and is the only one of them thus far known from British Guiana. In its large capsules and seeds it finds its closest ally in the geographically near *P. rugosum* Steyerm., but is at once distinguished from that species by the absence of glands on the petiole, being the only instance of such thus far known in the genus, otherwise well-marked by the occurrence of such petiolar glands. The leaves are more prominently pubescent on both surfaces than in *P. rugosum,* and the lateral pairs of nerves of the leaf-blades are more numerous than in *P. rugosum.* The two types of pubescence found on the lower surface of the leaf-blades in *P. eglandulosum,* expressed by a vestiture of soft dense hairs covering a minute tomentum in the reticulum of the veinlets, are known also in *P. orinocense,* but the latter species has smaller capsules and seeds, and has paired instead of ternate leaves.

Schradera Vahl, Eclog. Am. **1**: 35. *t. 5.* 1796.

Fuchsia Sw. Prodr. Veg. Ind. Occ. 62. 1788, not *Fuchsia* L. 1753.
Urceolaria Willd. in Cothenius, Dispos. Veg. 10. 1790, hyponym; J. F. Gmel. Syst. Nat. **2**: 390. 1791.
Uncariopsis Karst. Linnaea **30**: 152. 1859.

This genus is one of the nomina generica conservanda (See Appendix III. p. 312, International Code of Botanical Nomenclature. 1961. Utrecht, Netherlands; also see Taxon **9**(4) : 118. Apr–May. 1960), and is maintained as such in the present treatment.

At the time Standley published *Schradera surinamensis* in 1948 (Bull. Torrey Club **75**: 569), he noted that "Until recently few specimens of *Schradera* have been collected in South America, but those now coming to hand in greater numbers indicate that the genus is represented there by a rather large number of only slightly different but apparently well-marked species."

A study of recent collections from South America since 1948, especially from the Guayana Highlands and from the Pacific Coast of Colombia, reveals an even greater number of undescribed taxa than was originally suspected. The first of these, *S. nilssonii* Steyermark, was published in 1962 (Bol. Soc. Ven. Cien. Nat. **23**(101) : 83), and the remainder are presented in the present paper. Continued exploration of the South American countries will doubtless augment to an even greater extent the total number of distinct taxa.

The results of the present study are based upon material of the genus existing in the herbaria of the Chicago Natural History Museum, The New York Botanical Garden, and the United States National Museum.

Key to the Species of *Schradera*

1. Flowers solitary, each one subtended by an individual involucre; Peru. *S. subandina.*
1. Flowers capitate, three or more together subtended by a common involucre.
    2. Involucre 25–35 mm high, nearly concealing the flowers at anthesis.
        3. Involucre 25 mm high; calyx and hypanthium 10–13 mm long; corolla about 15–20 mm long, the tube somewhat longer than the lobes; Colombia. *S. lehmannii.*

3. Involucre 35 mm high; calyx and hypanthium 20 mm long; corolla 42 mm long, the tube nearly three times the length of the lobes; Colombia. *S. luxurians.*

2. Involucre 18 mm or less high, not concealing the flowers at anthesis.
 4. Summit of peduncle and/or involucre pubescent.
  5. Outer surface, at least in part, and summit of calyx pubescent.
   6. Involucre glabrous externally; summit of calyx densely papillose-ciliolate, the upper portion of the outer surface densely papillate cano-pulverulent; petioles and lower surface of leaf-blades glabrous; Colombia. *S. cuatrecasasii.*
   6. Involucre densely puberulous externally; calyx externally pilosulous; petioles and lower surface of leaf-blades pubescent; Colombia. *S. puberula.*
  5. Outer surface and summit of calyx wholly glabrous.
   7. Peduncle 3.5–10.5 cm long; heads 25–40-flowered; involucre 7–10 mm long; Venezuela. *S. nilssonii.*
   7. Peduncle 1 cm or less long; heads about 4-flowered; involucre 13–17 mm long; Colombia. *S. acuminata.*
 4. Summit of peduncle and involucre glabrous.
  8. Stigmas 4.
   9. Flowers 8-merous; calyx with usually 8 or more irregular denticulations at summit; peduncle solitary; Jamaica. *S. involucrata.*
   9. Flowers 6-merous; calyx truncate, the lobes, if any, obsolete or in fruit more evident; peduncles usually three, sometimes one; British Guiana. *S. ternata.*
  8. Stigmas 2–3.
   10. Leaves obovate, broadest toward apex or in upper half and broadly rounded to subtruncate at apex; Colombia. *S. rotundata.*
   10. Leaves otherwise, broadest at middle or base, tapering or narrowed to an acute or acuminate or to an obtuse or rounded apex.
    11. Midrib of lower side of leaf partly or wholly pubescent.
     12. Corolla rotate, the lobes slightly longer than the tube; leaf-blades ovate-elliptic or broadly elliptic, 2.7–5.5 cm broad, 6.5–8.5 cm long; Colombia. *S. acuminata.*
     12. Corolla salverform, the lobes obtuse, shorter than the tube; leaf-blades narrowly elliptic-oblong, 2.5–3.5 cm broad, 8.5–10.5 cm long; Colombia. *S. cacuminis.*
    11. Midrib of lower side of leaf completely glabrous.
     12. Peduncles 2 or more at a node.
      13. Heads robust, 3–3.5 cm broad, 2–2.5 cm high in fruit; leaf-blades abruptly acute to acuminate at apex, 13–15.5 cm long, 5–8 cm broad; Venezuela. *S. bipedunculata.*
      13. Heads smaller, 1–2.5 cm broad, 1–2 cm high in fruit; leaf-blades rounded or obtuse to subacute at apex, 5–12 cm long, 2–5 cm broad.
       14. Corolla-tube rotate, 3.5 mm long, shorter than the lobes; inner reflexed cucullate appendage of corolla-lobes located just below the apex; flowers often 4-merous; orifice of corolla with a dense brush of erect hairs; involucre 2.5 mm long (high); Venezuela. *S. suaveolens.*
       14. Corolla-tube salverform-tubular, 8–11 mm long, usually longer than, or sometimes equaling, the lobes; inner reflexed cucullate appendage of corolla-lobes located 4–5 mm below apex; flowers 5–6-merous; orifice of corolla naked, the tube pubescent below orifice; involucre 3–8 mm long (high), Guianas; Brazil. *S. polycephala.*
     12. Peduncles solitary at a node.
      15. Peduncle 0.5–1 cm long.
       16. Petioles 0.3–0.5 cm long; leaf-blades 1–2.3 cm broad.
        17. Lateral nerves on lower surface of leaf-blades obsolete or nearly so; leaf-blades abruptly acute to subacuminate, ovate-elliptic or elliptic-ovate chiefly; interior of corolla-tube partly puberulous; involucre 2–3 mm high; Venezuela. *S. maguirei.*

17. Lateral nerves on lower surface of leaf-blades 8–10 pairs; leaf-blades obtuse to acutish, narrowly lanceolate to lanceolate-oblong; interior of corolla-tube completely glabrous; involucre 7–8 mm high; Colombia. *S. revoluta.*
  16. Petioles 0.9–2 cm long; leaf-blades 5.5–9 cm broad; Colombia. *S. acuminata* (form)

15. Peduncle 2–14 cm long.
  17. Outer basal half of stipules puberulent; stigmas 3; Venezuela. *S. yutajensis.*
    18. Stipules glabrous throughout; stigmas 2.
      19. Corolla-tube glabrous within.
        20. Corolla in bud tapering to an elongated acuminate-subulate apex; Colombia. *S. neeoides.*
        20. Corolla in bud acute to obtuse or rounded at apex.
          21. Corolla-tube shorter than the lobes; involucre poorly developed, 2.5 mm or less long (high); Colombia. *S. stellata.*
          21. Corolla-tube longer than or equaling the lobes; involucre 2.5–16 mm or more long (high).
            22. Heads 15–20-flowered; corolla 11–20 mm long, the tube 7–10 mm long; lateral nerves of leaf-blades 12–14 on each side; Venezuela. *S. glabriflora.*
            22. Heads 3–7-flowered; corolla 22–37 mm long, the tube 13–21 mm long; lateral nerves of leaf-blades 5–9 on each side.
              23. Leaf-blades rounded or obtuse at apex and base; lateral nerves of leaf-blades 5–6, the tertiary venation poorly developed, not forming a close reticulum; corolla 37 mm long, tube 21 mm long; Cuba. *S. cubensis.*
              23. Leaf-blades acute to acuminate at base, obtuse to acute at apex; lateral nerves of leaf-blades 8–11, the tertiary venation more or less elevated and reticulate; corolla 22–26 mm long, tube 13 mm long; Trinidad, Venezuela. *S. clusiaefolia.*
      19. Corolla-tube more or less pubescent within.
        24. Lateral nerves of leaf-blades 5–8 on each side or not manifest.
          25. Leaf-blades abruptly acute or subacuminate at apex; inner cucullate appendage of corolla-lobe a blunt protuberance 0.5 mm long at 3–4 mm from apex; corolla-tube infundibuliform, the expanded throat 9 mm broad; Venezuela. *S. hilliaefolia.*
          25. Leaf-blades mainly rounded or obtuse (acute to acuminate in one variation of *S. vahlii*) at apex; inner cucullate appendage of corolla-lobe conspicuous, triangular to subulate, as much as 2.25 mm long at 5–12 mm from apex; corolla-tube salverform, the expanded upper portion 4–5 mm broad; West Indies, Guianas, Brazil.
            26. Orifice of corolla densely pilose; Brazil. *S. brasiliensis.*
            26. Orifice of corolla naked, the pubescence confined below the orifice; West Indies, Guianas, Brazil.
              27. Leaf-blades mainly 2½–3½ times as long as broad, usually narrowed or tapering at base and apex; calyx truncate or subtruncate, entire at margin: Guianas and Brazil. *S. polycephala.*
              27. Leaf-blades mainly 1½–2¼ times as long as broad, usually rounded, obtuse, or subacute at base and apex; calyx usually lobed or repand at apex; West Indies.

28. Corolla 35–40 mm long, the tube 22–25 mm long; Cuba. *S. cephalophora.*
28. Corolla 13–31 mm long, the tube 8–14 mm long; Lesser Antilles, Puerto Rico, Dominican Republic.
    29. Anthers subsessile, the filaments 1 mm long; flowers 7-merous; lower inner base of corolla-lobe sparsely pilosulous; Dominican Republic. *S. subsessilis.*
    29. Anthers on filaments 1.5–5 mm long; flowers 5–6-merous; corolla-lobe glabrous throughout; Lesser Antilles, Puerto Rico, Dominican Republic. *S. vahlii.*

24. Lateral nerves of leaf-blades 9–13 on each side.
  30. Peduncle 2.5–3.5 cm long.
    31. Calyx truncate or subtruncate; heads about 5-flowered; corolla 18–21 mm long, the tube 9.5–10 mm long; Ecuador. *S. campii.*
    31. Calyx irregularly shallowly lobed; heads 9–10-flowered; corolla 10 mm long, the tube 5 mm long; Venezuela. *S. brevipes.*
  30. Peduncle (4–)5–15 cm long.
    32. Lateral nerves on lower leaf surface prominent and elevated, 13–18; collective nerve prominently elevated and connecting ends of lateral nerves; Colombia. *S. marginalis.*
    32. Lateral nerves on lower leaf surface obscure, not prominent nor elevated, 8–11; collective nerve not elevated, obscurely connecting ends of lateral nerves; Guianas, Brazil.
      33. Involucre about 12 mm long (high); lateral nerves about 11; peduncle stout, 3–4 mm broad. *S. surinamensis.*
      33. Involucre about 3–8 mm long (high); lateral nerves 8–10; peduncle slender, 2–2.5 mm broad. *S. polycephala.*

Schradera acuminata Standl. Field Mus. Bot. **4**: 286. 1929 emendavit Steyermark

An examination of the holotype specimen in US, and of flowering material of additional specimens referable to this taxon necessitates an emended description of Standley's original publication as follows:

Costa media folii laminae subtus partim pilosula aliter glabra, superficie inferiori albo-papillata vel puncticulata; capitulis 1.5–1.7 cm longis 2–2.5 cm latis; involucro glabro vel leviter pilosula 1.3–1.7 cm longo 2–2.5 cm lato; corolla in alabastro rotata 10–12 mm longa, tubo 4–5 mm longo basi 3.5–4 mm lato fauce 6 mm lata, lobis 5 ovato-oblongis obtusis 5–6 mm longis 3 mm latis; denticulo cucullato reflexo triangulari ad basin carinae ab apicem 3 mm; staminibus 5, antheris linearibus in alabastro inclusis 4 mm longis; stylo 5 mm longo glabro; stigmatibus 2 linearibus.

In the holotype specimen the involucre is glabrous, but in *Perez Arbelaez 3011* it is sparsely to moderately pilosulous. It is likely that more intensive collections will reveal this taxon to be a ligneous vine rather than a ''tree'' as noted by collectors.

COLOMBIA. Dept. El Valle: forest, La Cumbre, Cordillera Occidental; alt. 1800–2000 m; tree; 7–10 May 1922, *F. W. Pennell 5146* (holotype US, isotype F); dense forest, San Antonio, west of Cali, near summit of Cordillera Occidental; alt. 1900–2350 m; tree about 8 m high; 26 Feb, 2 Mar 1939, *E. P. Killip & Hernando Garcia 33877* (F, US); Quesemal Jagua, 23 Jan 1935, *Perez Arbelaez 3011* (US).

A collection with completely glabrous and larger leaves is doubtfully referred to this taxon. The heads of the inflorescence are too young for positive analysis. The data for this specimen are as follows: Dept. El Valle: forest, on ridge of Cordillera Occidental, La Cumbre; alt. 2100–2400 m; tree; 11, 18 Sept 1922, *E. P. Killip 11384*. In this specimen the leaves attain a length of 13 cm and a width of 9 cm.

Schradera bipedunculata Steyermark, sp. nov.

Suffrutex volubilis; stipulis caducis; foliis petiolatis, petiolis 20–27 mm longis glabris; laminis subcoriaceis ovatis vel elliptico-ovatis apice subiter acutis vel acuminatis basi obtusis vel subacutis plerumque 13–15.5 cm longis 5–8 cm latis utrinque glabris, nervis lateralibus utroque latere 10–12 robustioribus, 10–14 aliis tenuioribus ab margine 5–8 mm anastomosin facientibus; capitulis 7–10-floris in fructu 3–3.5 cm latis 2–2.5 cm altis; pedunculis 2 ad apices ramulorum 5.5–8.5 cm longis basi 2–3 mm latis apice paullo latioribus ad 4 mm latis glabris; involucro brevi 6–7 mm alto apice truncato; calyce in fructu 3–4 mm alto; corollis non visis; baccis in sicco 12–16 mm longo 8–10 mm lato.

VENEZUELA. Estado Bolívar: montane woodland, Río Uiri-yuk, Alto Río Cuyuni; alt. 500–600 m; vine; fruit turning white; 20 Aug 1962, *Bassett Maguire, Julian A. Steyermark, & Celia K. Maguire 46814* (holotype NY, isotype VEN).

This species is characterized by having two slender, glabrous, rather elongated peduncles, a shallow truncate involucre, and a relatively, few-fruited infructescence. It is apparently most closely related to *S. polycephala* DC. of British Guiana and to *S. suaveolens* (Karst.) Steyerm. of Venezuela.

Schradera brevipes Steyermark, sp. nov. Fig. 78, J–L.

Suffrutex volubilis ad 15 m; stipulis conspicuis terminalibus aliter caducis obovato-oblongis vel oblongis apice rotundatis 16–20 mm longis 7–10 mm latis 5–6 mm connatis; foliis petiolatis, petiolis 10–18 mm longis, glabris; laminis coriaceis ovato-oblongis vel ovatis acutis vel acuminatis, basi rotundatis vel obtusis 9–13.5 cm longis 4.5–9 cm latis utrinque glabris, subtus costa media elevata prominentique, nervis lateralibus utroque latere 9–10 ab margine 3–7 mm arcuatam anastomosin facientibus; capitulis densifloris 9–10-floris depresso-hemisphaericis 10–13 mm altis 18–25 mm latis; pedunculo brevi solitario terminali 2.2–3.5 cm longo basi 3 mm lato apice ampliato ad 8 mm lato glabro; involucro 7–10 mm alto apice repando; calyce hypanthioque 8–10 mm longis basi 2.5 mm latis apice 6 mm latis; calyce plus minusve irregulariter undulato 6-lobato, lobis breviter suborbicularibus apice rotundatis 1 mm altis 1.5 mm latis, ab ovario ad 5 mm disjuncto; corolla alba (teste *Maguire & Politi*) 10 mm longa tubuloso-campanulata, tubo 5 mm longo basi 4 mm lato 2 mm supra basin constricto intus 2 mm supra basin glabro aliter cum lineis puberulentibus instructis, lobis 6 lanceolatis apice acuto-inflexis erectis 5 mm longis 1.5–2 mm latis; staminibus 6 prope medium corollae insertis; antheris lineari-oblongis 2.8 mm longis 0.7 mm latis, filamentis 2 mm longis; stigmatibus 2 oblongis; ovario obovoideo 3–4 mm longo 3–4 mm lato apice cum disco crasso undulato 1 mm alto coronato.

VENEZUELA. Amazonas: liana climbing to 15 m; in forest along north escarpment, Cerro Sipapo (Paráque); alt. 1400 m; flower white; 23 Dec 1948, *Maguire & Politi 27895* (holotype NY).

In its short peduncles *S. brevipes* resembles *S. acuminata* Standl. of Colombia. In that species, however, the heads are fewer-flowered with 4–5 flowers, the peduncle is much shorter, and the involucre is longer.

Schradera cacuminis Standl. Field Mus. Bot. **4**: 286. 1929 emendavit Steyermark

An examination of the holotype specimen of *S. cacuminis* in US and of the fragment of the holotype deposited in F necessitates an emended description of Standley's publication as follows: Costa media folii laminae subtus partim pilosula aliter glabra, superficie inferiori albo-papillata vel puncticulata; corollae lobis 4 vel 5 obtusis 2.5 mm latis, denticulo cucullato reflexo triangulari ad basin carinae ab apicem 3.5–4 mm; staminibus 4 vel 5 in fauce insertis.

The label on the holotype specimen states "tree," but it is likely that the plant is a woody epiphytic liana as in the other members of the genus.

Schradera campii Standley ex Steyermark, sp. nov.

Suffrutex volubilis epiphyticus; stipulis non visis; foliis petiolatis, petiolis 15–35 mm longis glabris; laminis coriaceis late vel anguste ellipticis vel oblongo-ellipticis apice plerumque acutis vel acuminatis interdum subobtusis basi acutis vel subacutis vel obtusis 10–16 cm longis 4–9 cm latis utrinque glabris, subtus costa media elevata, nervis lateralibus principalibus 9–11 tenuibus secundariis 12–16 tenuioribus, ab margine 3–6 mm anastomosin facientibus; capitulis subhemisphaericis ca. 5-floris 15–17 mm longis 13–20 mm latis; pedunculo solitario ut videtur laterali vel terminali 2.3–3.5 cm longo apice 4–8 mm lato glabro; involucro 6–8 mm alto 12–18 mm lato glabro ut videtur primo margine integro; calyce hypanthioque urceolato-turbinatis 9 mm longis apice 4 mm latis glabris, calyce apice truncato vel subtruncato, ab ovario ad 6 mm disjuncto; corolla alba (teste *Steere & Camp*) hypocrateriformi, tubo 9.5–10 mm longo basi 2 mm lato fauce 4 mm lata extus glabra intus apicem basi 2 mm lato fauce 4 mm lata extus glabra intus apicem basinque versus glabro medio piloso, lobis 5 lineari-lanceolatis apice subacutis 8–12 mm longis 1.75–2 mm latis glabris, denticulo cucullato reflexo breviter triangulari 0.3–0.4 mm longo ad basin carinae ab apicem 5.5–6.5 mm; staminibus 5 inclusis in dimidia parte inferiore insertis, filamentis 1.5 mm longis infra basin loborum corollae 9 mm insertis; antheris linearibus 5 mm longis; stylo 5.5 mm longo superne 1.5 mm pilosulo aliter glabro; stigmatibus 2 linearibus 2.5–3 mm longis.

ECUADOR. Prov. Oriente: flood plain of Río Pastaza, south of Shell-Mera, Parroquia Mera; alt. 1100 m; woody vine to 6 m, somewhat fleshy; leaves leathery, glaucous; flowers white, fleshy at base; somewhat succulent stems rooting at intervals; 13 May 1944, *W. C. Steere & W. H. Camp 8303* (holotype F). Prov. Napo-Pastaza: above Finca Black, densely forested slopes along Río Pastaza, between Río Topo at Topo and Mera; alt. 1675 m; epiphytic shrub; leaves thick, coriaceous, dark green above and shining; calyx and bract fleshy, pale green; corolla closed, narrow, creamy white; 6 Nov 1943, *Steyermark 54869* (paratype F, NY).

This is the first species of the genus *Schradera* to be recorded from Ecuador. It is characterized by the puberulous upper portion of the style, relatively few-flowered heads on short peduncles, and the relatively numerous lateral nerves of the leaf-blades.

Schradera cephalophora Griseb.

This species is apparently endemic to Cuba. It has been treated by previous workers as conspecific with *S. capitata* Vahl and *S. exotica* (Gmel.) Standl. [= *S. vahlii* Steyerm.], but is separated from them by the longer corollas, usually thicker leaf-blades, and scarcely or not at all manifest lateral nerves. The leaf-blades are generally broadly rounded to subcordate at base and broadly rounded at the summit.

CUBA. Woods, La Breña, Moa; climber, 2–3 m high; 1 Aug 1945, *Bros. Leon, Clemente, & Alain 22536* (NY); woods, headwaters of Lebisa river, Sierra de Cristal; alt. 500 m; 27 Dec 1955, *Bros. Alain & M. Lopez Figueiras 4589* (NY); valley of Cayoguán river, Moa; Jul 1949, *Bros. Alain & Clemente 884* (NY); headwaters of Arroyo Guaro, Sierra de Nipe; Jul 1940, *Bros. Leon & Alain 19133* (NY); woods, La Breña, Moa; June 1945, *Bro. Clemente 4598* (NY); thickets, Loma del Gato and vicinity, Cobre range of Sierra Maestra; alt. 900 m; climbing vine; white flowers, sweet-smelling; 11 Jul–14 Aug 1921, *Bros. Leon, Clemente, & Pre. M. Roca 9929* (NY); El Gato; 4 Aug 1944, *Bro. Alain 248* (NY).

Schradera clusiaefolia (Britton & Standl.) Williams & Cheesman, Fl. Trin. & Tobago **2**: 16. 1928.

Urceolaria clusiaefolia Britton & Standl. Jour. Wash. Acad. Sci. **13**: 106. 1923.
Urceolaria angustifolia Britton & Standl. Jour. Wash. Acad. Sci. **13**: 106. 1923.
Schradera angustifolia (Britton & Standl.) Williams & Cheesman, Fl. Trin. & Tobago **2**: 15. 1928.

Both *Urceolaria clusiaefolia* and *U. angustifolia* were described from non-flowering specimens of plants collected on Mount Tocuche in Trinidad. A recent flowering collection (*Steyermark & Agostini 91074*) from the tip of the Peninsula de Paria, Venezuela, which is adjacent to Trinidad, is conspecific with the Trinidad plants. Both the narrow-leaved (*Urceolaria angustifolia*) and broad-leaved (*Urceolaria clusiaefolia*) types of variations are present on the collections of the Venezuela plant. A comparative evaluation between the Trinidad and Venezuelan specimens leaves no doubt but that both should be referred to the same taxon. The short peduncles, short length of involucre, spathaceous lobed calyx, similar anastomosing of the lateral nerves of the leaf blades, and a fine papillate lower leaf surface with a delicately convolute minutely mosaic-like reticulum of the tertiary venation—these characteristics are shared by the Trinidad and Venezuelan plants.

Although the fine tertiary venation seems more pronounced, at first examination, in the type collection of *Urceolaria angustifolia*, it is apparent that it is likewise present on the broader leaves of *U. clusiaefolia*, as noted in the original description of the latter. The leaf apices in the Venezuelan collection are obtuse, as described for *Urceolaria angustifolia*, whereas in *U. clusiaefolia* they are stated to be acute. This difference, however, is not well-marked when the holotype specimen of *Urceolaria clusiaefolia* is compared with the Venezuelan collection.

An emended description of the present taxon, in view of the recent Venezuelan collection in flower, follows:

Frutex volubilis; stipulis non visis; foliis petiolatis, petiolis 5–15 mm longis; laminis oblongo-oblanceolatis vel oblongo-obovatis vel oblongo-ellipticis apice obtusis vel acutis basi acutis vel acuminatis, subrevolutis, 4.5–11 cm longis 1.2–5.5 cm latis, nervis lateralibus utroque latere 8–11 subtus plus minusve prominulis, in nervum collectivum ab margine 1–4 mm conjunctis, ultimis nervis tertiariis demum tenuissime subreticulato-elevatis, superficie subtus minutissime albo-papillata; capitulis depresso-hemisphaericis 6–7-floris 13–20 mm altis 25–30 mm latis; pedunculo solitario terminali 2–2.5 cm longo in sicco 2 mm lato vivo 4 mm lato glabro; involucro brevi 2.5–6 mm alto 6–12 mm lato glabro apice integro; calyce hypanthioque tubulosis 12–14.5 mm longis apice 5–6 mm latis glabris; calyce apice primo margine truncato deinde irregulariter inaequaliterque lobato, lobis suborbiculari-rhomboideis 1.5–3 mm altis 2.5–4.5 mm latis, ab ovario ad 8 mm disjuncto; corolla alba (teste *Steyermark & Agostini*) hypocrateriformi 22–26 mm longa, tubo 13 mm longo basi 3 mm lato fauce 5.5 mm lata extus glabro intus glabro superne papillato-pulverulenti; lobis 5 lineari-lanceolatis vel lanceolatis subacutis 11–14.5 mm longis 2.5 mm latis glabris, denticulo cucullato reflexo ad basin carinae ab apicem 7–8 mm; staminibus 5 exsertis, filamentis 3.5 mm longis glabris in fauce insertis; antheris 5 linearibus 5 mm longis; stylo 5 mm longo glabro; stigmatibus 2 anguste oblongis 4 mm longis.

TRINIDAD. Mt. Tocuche, Aug 1947, *Botanic Garden Herbarium 673* (tracing from holotype NY; holotype of *Urceolaria clusiaefolia*, TRIN); same locality, 21 Jun 1906, *William Leslie 9363* (holotype of *Urceolaria angustifolia,* TRIN, fragment of type NY). VENEZUELA. Estado Sucre: Peninsula de Paria: Cerro Patao, norte de Puerto de Hierro, noreste de Guiria; selva nublada en la cumbre plana; alt. 1020 m; climbing high in tree; stems dark purple; leaves erect-ascending, coriaceous, subrevolute, deep green above, pale green below; peduncle pale green, 4 mm diam; involucre lobed, pale green; corolla white, 5-lobed, lobes recurved; stamens 5; stigmas 2, pale green; calyx pale green, greenish and white above with subtruncate summit slightly slit to one side or almost 3-lobed unequally; generally 7 flowers in one head, rarely 6; 19 Jul 1962, *Julian A. Steyermark & Getulio Agostini 91074* (NY, VEN).

Schradera cuatrecasasii Standley ex Steyermark, sp. nov.

Suffrutex volubilis; stipulis non visis; foliis petiolatis, petiolis 10–12 mm longis glabris; laminis crassiusculis (teste *Cuatrecasas*) oblongo- vel ovato-ellipticis apice abrupte acutis basi obtusis vel subacutis 6.5–8.3 cm longis 3–4 cm latis utrinque glabris, nervis lateralibus utrinque prominentibus principalibus 6–7, nervis secundariis tertiariisque utrinque prominentibus laxe reticulatis, in nervum collectivum ab margine 3–5 mm conjunctis; capitulis subhemisphaericis ca. 5-floris 15 mm longis (altis) 2.3–3 cm latis; pedunculo solitario terminali 1.9–2 cm longo glabro; involucro 5 mm longo (alto) 12–13 mm lato glabro margine 8-denticulato, dentibus deltoideo-subulatis 0.5 mm longis; calyce hypanthioque tubuloso-campanulatis 8 mm longis apice 6.5–7 mm latis; calyce superne 2–3-carinata, apice repando-denticulato, dentibus acutis 0.2–0.3 mm longis, margine dense minute papillato-ciliolato, extus inferne glabro superne in parte dimidia superiore 2–2.5 mm dense cano-pulverulenti papillatoque carinis moderatim hispidulo-ciliolatis; corolla alba (teste *Cuatrecasas*) breviter hypocrateriformi 17 mm longa, tubo 10 mm longo basi 5 mm lato fauce paullo ampliata 6 mm lata extus glabro intus supra basin 5 mm glabro fauce pilosula aliter cum lineis pilosulis verticalibus instructis, lobis nardis vel cinereis (teste

Cuatrecasas) 5 late lanceolato-oblongis subacutis 7 mm longis 3 mm latis extus in alabastro cum marginibus papillatis aliter glabris intus dense minuteque cano-papillatis transverse rugulosis, denticulo cucullato reflexo subulato 1.5 mm longo apice penicillato ad apicem ipsum insidenti; staminibus 5, antheris exsertis linearibus 5 mm longis; filamentis glabris 4.5–5 mm longis exsertis ad faucem insertis; stylo 4 mm longo, in parte suprema 1.25 mm hirtello aliter glabro; stigmatibus 2 linearibus 4 mm longis.

COLOMBIA. Dept. El Valle: Costa del Pacifico, Río Naya: brazo Aji, orilla derecha en Calle Larga; alt. 1–4 m; enorme bejuco; hoja crasiuscula verde; caliz verde blanquecino; corola blanca con lobulas sucios de lila o grisaceos; 28 Feb 1943, *J. Cuatrecasas 14292* (holotype F).

This well-marked species is particularly characterized by the penicillate tip of the cucullate inner appendage of the corolla-lobe, occurring just below the apex, and by the ciliolate calyx with the uppermost outer portion papillate-puberulent. Only in *S. suaveolens* (Karst.) Steyerm. of Venezuela is the appendage situated at the apex of the corolla-lobe. The relatively large number of recent novelties that have turned up from Colombia is due to the tremendous botanical activity of Dr. José Cuatrecasas in the Pacific Coastal area of that country.

Schradera cubensis Steyermark, sp. nov.

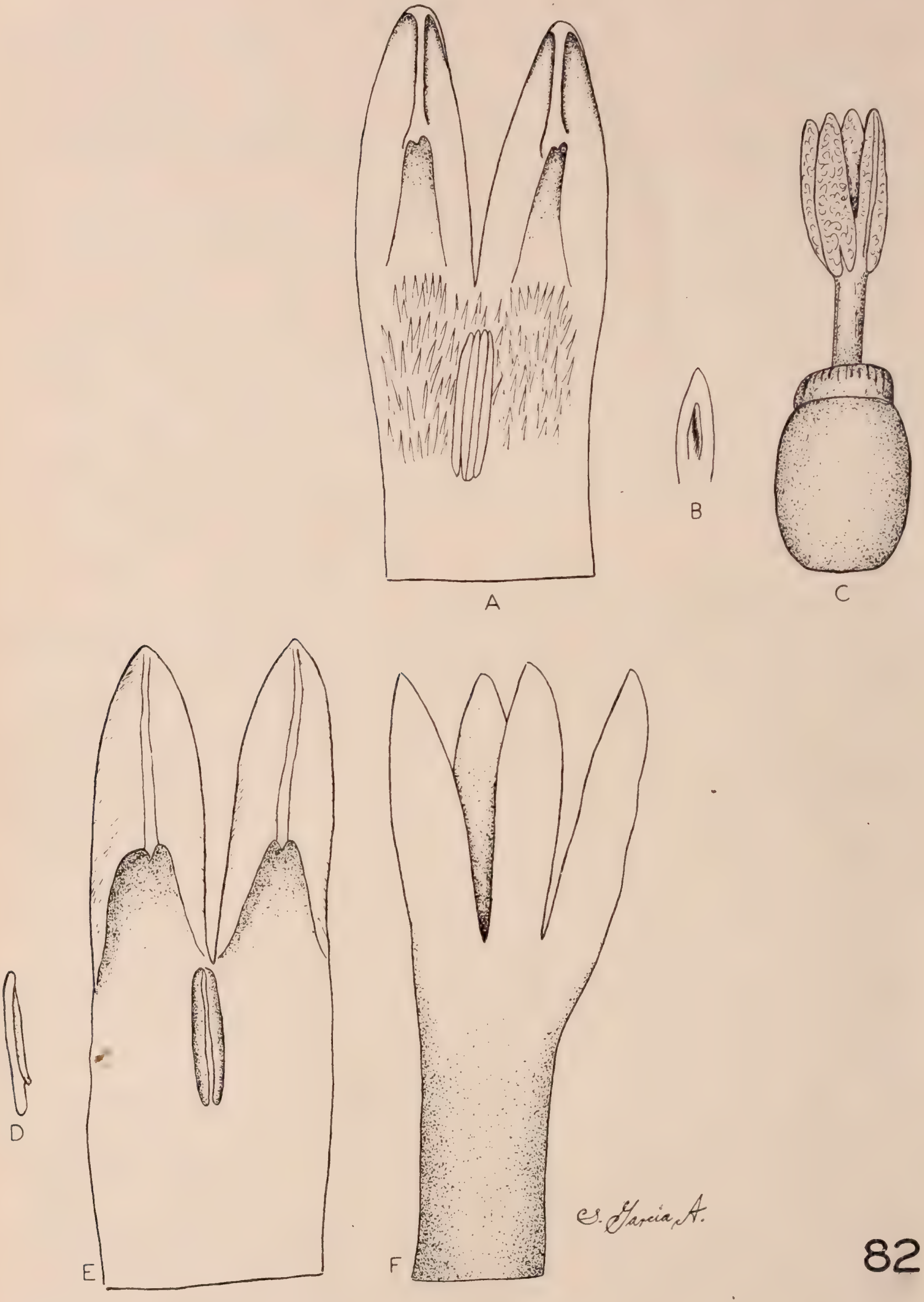
Planta ligneosa epiphytica; stipulis non visis; foliis petiolatis, petiolis 9–12 mm longis glabris; laminis late oblongis apice rotundatis basi obtusis vel rotundatis 3.5–6.8 cm longis 2–3.5 cm latis utrinque glabris, subtus costa media elevata, nervis lateralibus principalibus 5–6 subprominulis ceteris fere obsoletis, in nervum collectivum ab margine 2 mm conjunctis; capitulis subhemisphaericis 3–4-floris ca. 25 mm longis 20–25 mm latis; pedunculo solitario terminali 3 cm longo glabro; involucro apice integro 5 mm alto glabro; calyce hypanthioque tubulosis 12 mm longis apice 7 mm latis glabris, calyce apice truncato vel subtruncato irregulariter subrepando, ab ovario ad 7 mm disjuncto; corolla alba (teste *Ekman*) hypocrateriformi 37 mm longa, tubo 21 mm longo basi 3 mm lato fauce parce ampliata 5 mm lata, utrinque glabro; lobis 6 lineari-lanceolatis obtusis 17 mm longis 3 mm latis glabris, denticulo cucullato reflexo ad apicem 11 mm; staminibus 6, filamentis 4–5 mm longis glabris infra basin loborum corollae 5 mm insertis; antheris linearibus 6.5 mm longis; stylo 8–8.5 mm glabro; stigmatibus 2 lineari-oblongis 6 mm longis.

CUBA. Prov. Oriente: fangales, Sierra Maestra, prope Nanacal, prope Alto de Comejen; alt. ca. 1100 m; floribus sordide albis, odoratis; epiphytic; 7 Jul 1918, *E. L. Ekman 9368* (holotype NY).

This species is distinguished from the related Cuban *S. cephalophora* Griseb. by the entirely glabrous corolla and shorter style.

Schradera glabriflora Steyermark, sp. nov. Fig. 82, D–F.

Suffrutex volubilis; stipulis caducis; foliis petiolatis, petiolis 1.5–3 cm longis glabris; laminis coriaceis supra atroviridibus subtus pallidioribus ovatis apice subiter subacutis vel acutis basi obtusis vel rotundatis 11–15 cm longis 7–9 cm latis glabris, nervis lateralibus utroque latere 12–14 subascendentibus vel divaricatis, subtus manifeste tenuiter reticulatis puncticulatisque supra venulis laxe reticulatis, ab margine 3–5 mm anastomosin facientibus; capitulis 15–20-



82

FIG. 82. A–C, *Schradera ternata*. A, portion of corolla, spread open to show two corolla-lobes and one stamen, × 5. B, corolla-lobe viewed from within, showing grooved portion, × 1.25. C, ovary, disk and style with stigmas, from immature bud, × 5. D–F, *Schradera glabriflora*. D, stamen, lateral view, × 5. E, portion of corolla, spread open, showing two corolla-lobes and one stamen, × 5. F, corolla, × 5.

floris subglobosis 15 mm altis 30 mm latis; pedunculo 3.5–6 cm longo basi 3–3.5 mm lato apice 4–5 mm lato glabro; involucro rotundato 5–6 mm longo; calyce hypanthioque oblongo-urceolatis 10–11 mm longis 6 mm latis; calycis lobis 4 suborbicularibus rotundatis 1.5 mm altis 2–2.5 mm latis; corollae tubo carnoso cylindrico-tubuloso viridi-albo 7–10 mm longo basi 4–5 mm lato glabro, lobis 4–5 albis oblongo-lanceolatis subobtusis 8–10 mm longis 3.5–4.5 mm latis; staminibus 4–5 inclusis supra medium tubi corollae insertis; antheris subsessilibus lineari-oblongis 4 mm longis 1 mm latis 6 mm supra basin tubi corollae adnatis; stylo viridi tenui 8.5 mm longo glabro; stigmatibus 2 lineari-lanceolatis 4.5–5 mm longis.

VENEZUELA. Aragua: Parque Nacional "Henri Pittier"; trail above Pittier National Monument on Pico Paraiso to summit; alt. 1250–1600 m; epiphytic woody vine on tree at summit; leaves coriaceous, dark green above, pale below; 4 Sep 1960, *J. A. Steyermark & G. Agostini 17* (holotype VEN); en sitios descubiertos, Rancho Grande; alt. 1380 m; arbol pequeño arraigado sobre otro; flores blancas; 25 Sep 1951, *T. Garcia 150* (paratype VEN).

From the newly described *S. yutajensis* Steyerm., this species differs in the corolla-tube glabrous within, the sessile anthers, two instead of three stigmas, and often tetramerous instead of pentamerous flowers.

Schradera hilliaefolia Steyermark, sp. nov.

Suffrutex volubilis; stipulis terminalibus aliter caducis obovato-oblongis apice rotundatis 19 mm longis 7 mm latis 8 mm connatis; foliis petiolatis, petiolis 10–13 mm longis glabris; laminis coriaceis elliptico-ovatis subiter acutis vel subacuminatis, basi plerumque acutis vel subacutis 6.5–8 cm longis 3.5–4.5 cm latis utrinque glabris, subtus costa media paullo prominenti, nervis lateralibus utroque latere 7–8 evanescentibus tenuibusque vel fere obsoletis ab margine 3–4 mm anastomosin facientibus; capitulis ca. 7-floris depresso-hemisphaericis 25 mm altis 35 mm latis; pedunculo solitario 4 cm longo 2.5–3 mm lato glabro; involucro 12–16 mm alto apice irregulariter lobato, lobis 4–5 late ovato-suborbicularibus apice rotundatis 5–10 longis 8–11 mm latis; calyce hypanthioque 10–15 mm longis apice 9–10 mm latis glabris; calyce irregulariter lobato, lobis 2–4 late ovatis vel ovato-suborbicularibus apice rotundatis 2.5–5.5 cm longis 4–6 mm latis; corolla alba (teste *Wurdack & Adderley*) 25–26 mm longa, subcylindrico-infundibuliformi, tubo 16 mm longo, in parte cylindrica 11 mm longo, basi 4–5 mm lato supra in parte ampliata 9 mm lato, extus glabro intus supra basin ad 6 mm glabro aliter uniformiter creberrimeque puberulentibus pilis 0.3–0.5 mm longis instructis, lobis 5 late lanceolatis apice subacutis 10 mm longis 3–5 mm latis ab apicem 3–4 mm cum denticulo rotundato 0.5 mm longo instructo; staminibus 5 inclusis supra medium insertis; antheris linearibus 5–5.5 mm longis; filamentis 1.5 mm longis glabris; stylo 6.5 mm longo glabro; stigmatibus 5 mm longis.

VENEZUELA. Amazonas: forest edge south and east of Maroa, Río Guainia; alt. 130 m; vine climbing to 2 m high; corolla white; 4 Jul 1959, *J. J. Wurdack & L. S. Adderley 43316* (holotype NY).

This species is characterized by the combination of the large subinfundibuliform corolla, densely puberulous within the tube, the blunt short protuberance on the inner part of the corolla-lobe, glabrous lobate involucre and calyx, solitary peduncle, and weakly or scarcely nerved leaf-blades.

Schradera involucrata (Sw.) Schumann, Mart. Fl. Bras. **6**(6) : 295. 1889.

Fuchsia involucrata Sw. Prodr. Veg. Ind. Occ. 62. 1788.
Schradera cephalotes Willd. Sp. Pl. **2**: 238. 1799.
Schradera jamaicensis Pers. Syn. Pl. **1**: 201. 1805.
Urceolaria involucrata (Sw.) Standl. N. Am. Fl. **32**(2) : 132. 1921.

Swartz described *Fuchsia involucrata* as simply ''floribus involucratis. Jamaica'' (Prodr. Veg. Ind. Occ. 62. 1788). Although it may be argued that this is merely a generic description which can be applied to any species of the genus *Schradera,* and as such would constitute a *nomen nudum* or *subnudum,* Swartz's description, as applied to the genus *Fuchsia* L., apparently so intended at Swartz's time, was indeed sufficiently definitive, though brief.

The Jamaican species has been treated under different names, as indicated in the above synonymy. It is well-differentiated from other species of the genus by the 4 styles, 8 corolla-lobes, 8 stamens, and 8-denticulate calyx margin. It is apparently an endemic species known only from the island of Jamaica.

JAMAICA. Grierfield, near Moneague (Parish of St. Ann's); wooded hill; 3 Apr 1908, *N. L. Britton 2666* (NY); Resource, near Holly Mount; growing over old stone wall; alt. 605 m; 14 Feb 1905, *Wm. Harris 8894* (NY).

Schradera lehmannii Standl. Field Mus. Bot. **7**: 41. 1930. emendavit Steyermark.

A study of the holotype fragment of *Schradera lehmannii* preserved in F indicates the necessity of emending Standley's original description as follows:

Calyx hypanthiumque tubulosi ca. 10–13 mm longi apice 4–5 mm lati glabri, calyce apice subtruncato vel repando-denticulato 10 mm longo; corolla hypocrateriformi ca. 15–20 mm longa, tubo (ut videtur) 8 mm longo 3–4 mm lato intus superne inferneque glabro aliter parce villosulo, lobis lanceolato-oblongis obtusiusculis 7 mm longis 2 mm latis glabris, denticulo cucullato reflexo triangulari 1 mm longo ad basin carinae ab apicem 7 mm; staminibus 5 ut videtur in dimidia parte inferiori insertis; antheris linearibus 7 mm longis.

Due to the poor state of preservation of the lower part of the corolla, it has not been possible to determine with certainty the nature of the base of the corolla, the style, or the attachment of the filaments.

Schradera luxurians Standl. ex Steyermark, sp. nov.

Suffrutex epiphyticus, ramis juvenilibus angulatis subhirtellis; stipulis non visis; foliis petiolatis, petiolis 18–25 mm longis parce vel moderatim puberulis; laminis coriaceis oblongo-ellipticis vel elliptico-oblongis apice abrupte acuminatis basi obtusis vel subobtusis 12–20 cm longis 5–8 cm latis, costa media subtus elevata pilosula pilis brevibus instructis, superficie inferiore moderatim puberula, nervis lateralibus prominentibus, principalibus 13–16 in nervum collectivum ab margine 3–5 mm conjunctis, nervis lateralibus minoribus 15–17; capitulis ca. 4–5-floris; pedunculo solitario terminali 0.8 cm longo 6 mm lato dense hirsutulo; involucro profunde campanulato-cyathiformi partim flores occultanti 35 mm longo (alto) 35 mm lato extus moderatim puberulo irregulariter lobato, lobis 2–3 mm longis; calyce hypanthioque tubulosis 20 mm longis apice 10 mm latis; calyce extus superne parce adpresso-strigilloso aliter glabro, irregulariter inaequaliterque lobato, lobis ca. 5 rhomboideis truncatis vel rotundatis 1.5–3 mm longis; corolla alba (teste *Cuatrecasas*) hypocrateriformi 42 mm longa, tubo 30 mm longo basi 5.5 mm lato superne 6 mm lato, extus glabro intus cum 5

lineis verticalibus puberulis ca. 9 mm longis in parte basilari glabro; lobis 5 lanceolatis subacutis 11 mm longis 2.8–3 mm latis glabris, denticulo cucullato reflexo triangulari 0.2 mm longo ad basin carinae ab apicem 8.5–9 mm; staminibus 5 inclusis in dimidia parte inferiori 9–10 mm supra basin corollae insertis, filamentis 0.5 mm longis; antheris linearibus 7 mm longis subsessilibus; stylo 21 mm longo superne puberulo aliter glabro; stigmatibus 2 lineari-oblongis 8 mm longis.

COLOMBIA. Dept. El Valle: Costa del Pacifico; Río Yurumanguí: entra Isla de Golondro y La Amargura; alt. 10–40 m; arbusto epifito de ramos tortuosas pendulas; bracteas y cáliz verdes; corola blanca; 7 Feb 1944, *J. Cuatrecasas 16028* (holotype F); Río Calima (region del Chocó); La Trojita; alt. 5–50 m; arbolito apoyado de ramos bejucosas; ramos terminales y las hojas coriaceas rigidas verde pálidas; bracteas involucrales y cáliz verde pálidos; corola blanca amarillenta; 19 Feb–10 Mar 1944, *Cuatrecasas 16543* (paratype F).

This species differs from *S. lehmannii* Standl., also of Colombia, in the densely pubescent midrib of the lower side of the leaf, the pilosulous lower leaf surface, the pubescent upper portion of the calyx, and the more densely pubescent outer surface of the involucre and peduncle. The puberulous upper part of the style and elongate corolla and calyx are additional distinctive features of this species.

Schradera maguirei Steyermark, sp. nov.

Suffrutex (teste *Maguire*) metralis, ramis carnosis; stipulis glabris, 5–7 mm longis 2.5 mm latis, subobtusis; internodiis plurimis brevibus 1.5–3 cm longis; foliis abrupte petiolatis, petiolis tenuibus 4–5 mm longis 0.75 mm latis, glabris; laminis parvis carnoso-coriaceis lanceolato-ellipticis vel elliptico-ovatis vel ovato-ellipticis apice abrupte acutis vel obtuse subacuminatis basi obtusis vel subacutis 3.5–5 cm longis 1–2.3 cm latis utrinque glabris, subtus costa media elevata, subtus nervis lateralibus obsoletis supra tenuibus utroque latere 6, subrevolutis; capitulis subhemisphaericis 3–5-floris 15 mm longis 23 cm latis; pedunculo solitario terminali 0.4–0.8 cm longo apice 2.5 mm lato glabro; involucro 2–3 mm alto 9 mm lato glabro remote denticulato dentibus subulatis 0.1–0.2 mm longis; calyce hypanthioque tubulosis 10.5 mm longis apice 4.5 mm latis glabris, calyce apice subtruncato irregulariter 2–3-lobato, lobis suborbicularibus rotundatis 0.5–1 mm altis 1.75–3 mm latis; corolla alba (teste *Maguire*) hypocrateriformi, tubo 6 mm longo fauce 4 mm lata extus glabro intus 3 mm supra basin puberulenti aliter glabro, lobis 5 lanceolatis apice subobtusis 6 mm longis 1.5 mm latis glabris, denticulo cucullato reflexo triangulari fere 1 mm longo ad basin carinae ab apicem 3 mm; staminibus 5–6 inclusis, filamentis 1 mm longis; antheris linearibus 3.5 mm longis; stylo 2 mm longo glabro; stigmatibus 2 ovali-oblongis 1.5 mm longis.

VENEZUELA. Territorio Federal Amazonas: Cerro Guaiquinima; occasional in quebrada in dense woodland, North Valley; alt. 1600–1700 m; subshrub; leaves fleshy-coriaceous; flowers white; 4 Jan 1952, *Bassett Maguire 32974* (holotype NY, isotype VEN); same locality; occasional along quebradas in lateral south drainage of North Valley; alt. 1700 m; shrub 1 m high; leaves coriaceous; flowers white; 2 Jan 1952, *Maguire 32907* (paratype NY, VEN).

This species is most closely related to the Colombian *S. revoluta* Standl., from which it differs in lacking lateral nerves on the lower surface of the leaf-blades, the differently shaped abruptly acute to subacuminate leaf-blades, the partly puberulous inner portion of the corolla-tube, and the much shorter involucre. This species, together with *S. revoluta,* possesses the smallest leaves of the genus.

Schradera neeoides Standl. ex Steyermark, sp. nov.

Arbor parva (teste *Cuatrecasas*); stipulis non visis; foliis petiolatis, petiolis 6–12 mm longis glabris; laminis membranaceis elliptico-oblongis apice subiter acuminatis, acumine 9–12 mm longo, basi obtusis vel rotundatis 8.5–11.5 cm longis 3–4.7 cm latis utrinque glabris, subtus costa media elevata, nervis lateralibus principalibus utroque latere 10–12 tenuibus impressis, nervo connectivo obsoleto; capitulis depresso-hemisphaericis 6–7-floris 15 mm longis (corolla exclusa) 25 mm latis; pedunculo solitario terminali 2.5–3.5 cm longo glabro basi 3 mm lato apice 4.5 mm lato; involucro ut videtur brevi 2–4 mm alto glabro; calyce hypanthioque tubulosis 13 mm longis apice 6 mm latis glabris, calyce apice truncato; corolla in alabastro apicem versus attenuata longiacuminato-subulata 27–30 mm longa, tubo in alabastro 10 mm longo basi 3 mm lato fauce 4.5 mm lata glabro; lobis 5 linearibus longiacuminatis subulatisque 17–20 mm longis 1–1.5 mm latis glabris; staminibus 5 ad basin tubi insertis, filamentis 2 mm longis glabris; antheris linearibus 4.5 mm longis; stylo 4 mm longo glabro; stigmatibus 2 linearibus 3 mm longis.

COLOMBIA. Dept. El Valle: Río Calima (region del Chocó), La Trojita; alt. 5–50 m; arbolito; hoja membranosa, flexible, verde amarillenta muy brillante; bracteas y cáliz verde amarillo, exteriormente amarillo verdoso pálido; 19 Feb–10 Mar 1944, *J. Cuatrecasas 16599* (holotype F).

This species differs markedly from other species of the genus in the elongate-tipped corolla-lobes, conspicuously so in bud, the completely glabrous corollas, the short, poorly developed involucre, and the insertion of the stamens at the base of the corolla-tube.

Schradera nilssonii Steyerm. Bol. Soc. Ven. Cien. Nat. **23**(101): 83. 1962. emendavit Steyermark.

An examination of additional material collected since the original description and a re-examination of the holotype, isotype, and paratype require the following emendation of the original description:

Stipulae anguste oblongae apice rotundatae 20 mm longae 10 mm latae praesertim inferne et per costam mediam moderatim puberulae superne leviter puberulae; foliorum laminae 10–15 cm longis 4–6.5 cm latis, subtus costa media plus minusve puberula; pedunculo 3.5–10.5 cm longo.

Additional specimens examined: VENEZUELA. Estado Bolívar: forested summit of Sierra de Lema, headwaters of Río Chicanán above high north-facing sandstone bluffs; epiphyte on tree; leaves coriaceous, dark green above, silvery green below; peduncle green; calyx greenish-white; corolla white, 5-parted, valvate; 29 Aug 1961, *Steyermark 89621* (NY, VEN); montane forest, cumbre of La Escalera, Río Uiri-yuk, Alto Río Cuyuni; alt. 1000 m; infrequent, high-climbing epiphyte to 20 m; peduncle slightly clavate; 20–21 Aug 1962, *Bassett Maguire, J. A. Steyermark, & Celia K. Maguire 46902* (NY, VEN).

Schradera polycephala DC. Prodr. **6**: 437. 1830.

Distribution. Lowland areas in the Guianas and Amazonian Brazil.

This species simulates *S. suaveolens* (Karst.) Steyerm. in shape and width of leaves, size of head, and length of peduncle, but differs strikingly in floral details.

Schradera puberula Steyermark, sp. nov.

Suffrutex volubilis, stipulis non visis; foliis petiolatis, petiolis 15–18 mm longis puberulis; laminis subcoriaceis late ovatis vel oblongo-ovatis apice abrupte acutis vel subacuminatis basi obtusis vel subrotundatis 8.5–12 cm longis 4.7–6.5 cm latis, costa media nervis lateralibusque subtus dense pilosulis superficie inferiore parce vel moderatim puberulenti, nervis lateralibus principalibus prominentibus elevatis utroque latere 11–13 in nervum collectivum ab margine 3–5 mm conjunctis, nervis lateralibus minoribus 12–20 tenuiter impressis subreticulatis; capitulis subhemisphaericis ca. 8–9-floris 20 mm longis (altis) 38 mm latis (in sicco); pedunculo non viso; involucro subcampanulato 15 mm longo (alto) 35 mm lato dense puberulo apice irregulariter lobato; calyce in fructu 8 mm lato extus puberulo.

COLOMBIA. Dept. El Valle: Cordillera Occidental, vertiente occidental: bosques Hoya del Río Digua, lado izquierdo: Piedra de Moler; alt. 900–1180 m; arbolito con ramas bejucosas; hojas semicoriaceas, verde claro; 19–28 Aug 1943, *J. Cuatrecasas 15182* (holotype F).

Although the material has fruit only, the species is otherwise well-marked in possessing a pubescent calyx and pubescent petioles and lower leaf surface. It is further distinguished from the related *S. lehmannii* Standl. by the much shorter involucre and pubescent calyx and leaf-blades, from *S. acuminata* Standl. by the pubescent calyx and involucre, and from *S. cuatrecasasii* Standl. ex Steyerm. by the pubescent petioles, leaves, and involucre, and pubescence of calyx with longer hairs.

Schradera rotundata Standl. ex Steyermark, sp. nov.

Suffrutex volubilis epiphyticus; stipulis non visis; foliis petiolatis, petiolis 12–40 mm longis glabris; laminis crasso-coriaceis (teste *Cuatrecasas*) late obovatis apice late rotundatis vel subtruncatis basi cuneatim angustatis acutis vel acuminatis 7.5–16 cm longis 4–8 cm latis utrinque glabris, subtus costa media elevata, nervis lateralibus principalibus utroque latere 9–19 tenuibus vel paullo prominulis nervis minoribus tenuissimis vel obsoletis, in nervum collectivum ab margine 5–6 mm conjunctis; capitulis subhemisphaericis 5–6-floris 20–25 mm longis 25–30 mm latis; pedunculo solitario terminali vel axillari 0.5–1.7 cm longo apice ampliato 6–7 mm lato glabro; involucro prominenti subcampanulato 13–15 mm alto 27–30 mm lato glabro irregulariter lobato, lobis ca. 10 suborbicularibus rotundatis 2–3 mm altis 6–7 mm latis; calyce hypanthioque urceolatis 11 mm longis apice 6 mm latis glabris, calyce apice primo margine truncato integro deinde irregulariter 2–3-lobato, lobis truncatis rhomboideis 0.5 mm altis, ab ovario ad 7 mm disjuncto: corolla alba (teste *Cuatrecasas*) hypocrateriformi 17 mm longa, tubo 11 mm longo basi 2 mm lato fauce 3 mm lato extus glabro intus supra basin 3 mm glabro aliter puberulo, lobis 5 lanceolatis apice subacutis 8 mm longis 2 mm latis glabris, denticulo cucullato reflexo triangulari ad basin carinae ab apicem 6 mm; staminibus 5 in dimidia parte inferiore insertis, antheris linearibus 5 mm longis; stylo 6 mm longo glabro; stigmatibus 2 linearibus 3.5 mm longis; seminibus fuscis ovalibus rhomboideis vel ovali-oblongis 2 mm longis 1.2–1.5 mm latis tenuissime foveolatis margine breviter alata.

COLOMBIA. Dept. El Valle: Costa del Pacifico, Río Cajambre, Barco; alt. 5–80 m; frutex epifito, ramas bejucosas; hoja gruesa coriacea, rigida verde oscura haz, verde amarillenta enves; periantio blanco; bracteas y ovario verde amari-

llentos; 21–30 Apr 1944, *J. Cuatrecasas 17187* (holotype F); Río Cajambre, Silva; alt. 5–80 m; arbusto bejucoso epifita; hoja craso-coriacea, verde brillante haz, verde amarillente enves; 5–15 May 1944, *Cuatrecasas 17537* (paratype F); Río Yurumangui, Veneral; bosques; alt. 5–50 m; gran bejuco; hoja craso-coriacea; corola blanca (o azulada en capullo otra dia); 28 Jan–10 Feb 1944, *Cuatrecasas 15755* (paratype, 3 sheets, F).

Schradera rotundata is distinguished by the broadly obovate leaves broadly rounded to subtruncate at the summit, prominently developed involucre, and short peduncles.

Schradera suaveolens (Karst.) Steyermark, comb. nov.

Uncariopsis suaveolens Karst. Linnaea **30**: 153. 1857.

An examination of a fragment of the type collection of *Uncariopsis suaveolens* Karst. from the herbarium at Vienna, preserved in F, indicates that it is a well-marked species which has been neglected up to the present time by later authors. Standley in his Rubiaceae of Venezuela (Field Mus. Bot. **7**: 383. 1931) combined the Venezuelan species with *Schradera exotica* (J. F. Gmel.) Standl. [= *S. vahlii* Steyermark] of the West Indies, and stated that he had "seen no material of Karsten's species, but from the illustration and description it does not appear to differ from the West Indian plant" (loc. cit.). Actually, both the plate and description in Karsten's Fl. Columb. 181. *pl. 90.* 1858–61, indicate floral details quite at variance from those found in the West Indian plant.

The short subrotate corolla with relatively short glabrous tube and villous-barbate throat immediately places this taxon apart from *S. polycephala* DC., which it most closely resembles, as well as the various species of the West Indies, which have longer salver-form corollas, longer involucres, naked corolla throat, and differently shaped leaves. An outstanding difference of *S. suaveolens,* which separates it from these and most other species of the genus, is the occurrence immediately below the apex of the corolla-lobe of the inner reflexed cucullate appendage. In the other species this appendage is situated several or more millimeters away from the apex of the corolla-lobe. Only in the Colombian *S. cuatrecasasii* is this appendage at the immediate summit of the corolla-lobe. *Schradera suaveolens* often has tetramerous flowers, a character which further differentiates it from the 5–8-merous flowers of the other species with which it has been confused.

The locality from which *Uncariopsis suaveolens* Karst. originated is in the state of Carabobo in the Coastal Range of northern Venezuela. A good match for the Karsten plant is *Steyermark 89990* from the adjacent state of Miranda, and also in the Coastal Cordillera. The collection of *Tamayo 2212* is almost a topotype, coming from the same general portion of the Coastal range as that originally collected by Karsten.

The following known collections of the species indicate it to have a restricted range within a limited section of the Coastal Cordillera of Venezuela:

Estado Carabobo: in silvis frondosis prope Puerto Cabello, in monte, Cumbre de Valencia; alt. 1600 m; *Karsten* (fragment of holotype, F); en selvas pluviales de Borburata; arbol pequeño de 5–8 m; Feb 1942, *F. T. Tamayo 2212* (US). Distrito Federal: selvas nubladas de la Fila de Agua Negra; arbusto; Feb 1938, *Tamayo 460* (VEN). Estado Miranda: selvas pluviales del Guatopo; alt. 400–600 m; bejuco de hojas coriaceas carnosas; 15 Nov 1956, *A. L. Bernardi 5725*

(NY); same locality; epifita lianiforme; 28 Nov 1956, *Bernardi 5905* (NY); Santa Teresa, Sep 1955, *H. M. Curran 2* (NY); Parque Nacional de Guatopo; evergreen forest on steep slopes bordering Río Santa Cruz, between Santa Teresa and Altagracia de Orituco, 14.5 km from Los Alpes; high climbing epiphyte on tree; peduncle yellow green, dilated above, angled; calyx greenish-white; corolla white, 4-lobed; stamens 4; 23 Nov 1961, *Steyermark 89990* (NY, VEN).

Schradera subsessilis Steyermark, sp. nov.

Suffrutex epiphyticus; stipulis non visis; foliis petiolatis, petiolis 8–20 mm longis glabris; laminis coriaceis ovali-oblongis apice obtusis vel subrotundatis, basi rotundatis 4.5–7 cm longis 3–4 cm latis utrinque glabris, subtus costa media elevata, nervis lateralibus principalibus 5–6 fere obsoletis; capitulis subhemisphaericis 8–9-floris 30 mm longis 35 mm latis; pedunculo solitario terminali 4 cm longo basi 4 mm lato apice ampliato ad 10 mm glabro; involucro 13 mm alto apice irregulariter lobato; calyce hypanthioque 17–18 mm longis apice 7 mm latis glabris, calyce inaequaliter irregulariterque 5–7-lobato, lobis subtruncatis vel depresso-rotundatis 0.5–1 mm altis, 1–3 mm latis, ab ovario ad 10 mm disjuncto; corolla alba (teste *Howard*) 30 mm longa hypocrateriformi, tubo 14 mm longo basi 2 mm lato extus glabro intus 4 mm supra basin glabro aliter cum lineis pilosulis verticalibus instructis, lobis 7 lineari-lanceolatis apice obtusis 16 mm longis 2.5–2.75 mm latis intus parte plana inferiore parce puberula, denticulo cucullato reflexo subulato 1 mm longo ad basin carinae ab apicem 11 mm; staminibus 7 inclusis, filamentis 1 mm longis infra basin loborum corollae 7 mm insertis; antheris linearibus 6 mm longis; stylo 10 mm longo glabro; stigmatibus 2.

DOMINICAN REPUBLIC. Prov. Barahona: Monteada Nueva to Loma Alta; alt. 1500 m; epiphytic shrub; flowers white; petals thick; 2 Aug 1950, *R. A. Howard 12302* (holotype NY); inter brachis rivulorum Cañada maluca; alt. 1400 m; Apr 1912, *Padre Miguel Fuertes 1487* (paratype NY).

The 7-merous flowers, the subsessile anthers included half way down the corolla-tube, and the pubescent lower inner half of the corolla-lobes are distinctive features of this taxon.

Schradera ternata Steyermark, sp. nov. Fig. 82, A–C.

Suffrutex epiphyticus; stipulis terminalibus aliter caducis anguste oblongis apice obtusis vel rotundatis 13–15 mm longis 8 mm latis glabris; foliis petiolatis, petiolis 10–23 mm longis glabris; laminis subcoriaceis supra atroviridibus subtus pallidioribus ovatis vel elliptico-ovatis apice subiter acutis vel acuminatis basi acutis subacutis vel obtusis 8.5–14 cm longis 4.5–8 cm latis glabris, nervis lateralibus utroque latere 6–7 tenuibus ab margine 3–4 mm anastomosin facientibus; capitulis 4–7-floris depresso-globosis; pedunculis 3 ad apices ramulorum vel interdum 1 in axillis superioribus 3–6 cm longis basi 2.5–3 mm latis apice incrassatis 6–12 mm latis glabris; involucro obsoleto vel cum 1–2 bracteis disjunctis vel paullo cohaerentibus ovalibus vel suborbiculari-ovalibus 7–8 mm longis 7–9 mm latis; calyce hypanthioque 10–13 mm longis 9–12 mm latis urceolato-globosis glabris; calyce apice truncato, lobis obsoletis; corolla alba (teste *Tillett*) carnosa 14–15 mm longa extus glabra, tubo 7–8 mm longo basi 3.5–4 mm lato intus basi glabro aliter pilis albidis villoso, lobis 6 oblongo-lanceolatis apice rotundatis 7–8 mm longis 2.5–3 mm latis 1.5 mm crassis 3.5 mm infra apicem sulcatis; staminibus 6 prope medium tubi corollae insertis; antheris lineari-oblongis 4.5 mm longis 1 mm latis; stylo 2–6.5 mm longo 1 mm lato glabro sulcato; stigmatibus 4 longioribus quam stylis in alabastro brevioribus quam stylo in anthesi oblongo-lanceolatis obtusis 4–5 mm longis 1 mm latis carnoso-papillatis; ovario late oblongo 4–5 mm alto 3 mm lato apice cum disco crasso annulari 0.7 mm alto coronato.

BRITISH GUIANA. Northeast side of Mount Ayanganna; mixed evergreen forest; alt. 884–915 m; leaves moderately thick, brittle, dark green above, lighter below; calyx greatly enlarged, spherical in shape; corolla white, thick, fleshy, lobes 6; stamens yellow, 6; stigma 3-lobed; base of corolla within white-villous; 2 Aug 1960, *Stephen S. & Carolyn L. Tillett & Rufas Boyan 44992* (holotype NY).

This species has an umbel of three inflorescences on peduncles terminating the stem. In this respect it approaches *S. polycephala* DC., from which it differs in the hexandrous, 6-parted corollas, relatively fewer-flowered heads, larger and broader leaf-blades more acutely pointed, and greater reduction of involucre. It is easily distinguished by its combination of ternately umbellate peduncles, few-flowered inflorescences, marked reduction of involucre, and hexandrous 6-parted corollas.

Schradera yutajensis Steyermark, sp. nov. Fig. 70, G–H.

Frutex (teste *Maguire*) 2–3-metralis; stipulis terminalibus aliter caducis elliptico-oblongis vel oblongis apice obtusis vel rotundatis 12–19 mm longis 6–7 mm latis infra medium parce pilosulis aliter glabris; foliis petiolatis, petiolis 10–14 mm longis glabris; laminis subcoriaceis oblongis vel ovato-oblongis apice obtusis vel subobtusis vel acutis, basi obtusis vel rotundatis 7–11.5 cm longis 3–6.5 cm latis glabris, nervis lateralibus tenuibus utroque latere 8–10 subtus plerumque manifestis supra obsoletis vel fere obsoletis; capitulis 9–12-floris subhemisphaericis 12–20 mm altis 22–27 mm latis; pedunculo solitario terminali 3–5 cm longo basi 2–3 lato apice incrassato 4–5 mm lato glabro; involucro 6-lobato 8 mm alto; calyce hypanthioque obconicis 10–11 mm longis basi 2–2.5 mm latis apice 7 mm latis glabris, calyce apice truncato: corolla alba (teste *Maguire*) 17 mm longa cylindrico-campanulata, tubo 10.5 mm longo basi 4 mm lata, intus supra medium moderatim pilosa aliter glabra, lobis 5 reflexis lanceolatis acutiusculis 6 mm longis 2 mm latis incrassatis 3.5–4 mm infra apicem sulcatis cucullatis; staminibus 5 supra faucem 1.5 mm exsertis in fauce tubi corollae insertis; antheris lineari-oblongis 3.2 mm longis 0.8 mm latis; filamentis 3 mm longis glabris; stylo 5 mm longo glabro; stigmatibus 3 brevioribus quam stylo anguste lanceolatis obtusis 3 mm longis 0.5 mm latis papillato-carnosis.

VENEZUELA. Amazonas: occasional in woodland along right fork of Caño Yutaje, Cerro Yutaje; alt. 1500 m; shrub 2–3 m high; flowers white; 21 Feb 1953, *Bassett & C. K. Maguire 35356* (holotype NY).

This species resembles *S. surinamensis* Standl., from which it differs in the outer puberulent basal half of the stipules, shorter peduncles, and more obtusely pointed stipules. Since none of the known specimens of *S. surinamensis* possess corollas, no comparison can be given with respect to floral characters.

Schradera vahlii Steyermark, nom. nov.

Urceolaria exotica Gmel. Syst. Nat. **2**: 390. 1791; Standl. N. Am. Fl. **32**(2): 132. 1921 [excl. syn.]
Schradera capitata Vahl [excl. syn.] Eclog. Am. **1**: 35. *t. 5.* 1796.
Schradera exotica (J.F.Gmel.) Standl. Field Mus. Bot. **4**: 286. 1929.
Urceolaria capitata (Vahl) Fritsch, Oesterr. Bot. Zeits. **44**: 288. 1894.

In citing *Fuchsia involucrata* Sw. in synonymy, Vahl's name, *Schradera capitata,* must be considered superfluous, and, therefore, rejected (Art. 63, p. 49. International Rules of Botanical Nomenclature). *Urceolaria exotica* Gmel. (Syst. Nat. **2**: 390. 1791) was published without description or with indication of origin, and has been accepted as a taxonomic synonym (Taxon **9**: 118. April–May, 1960). It cannot be applied definitely to an existing taxon. Although Standley (N. Am. Fl. **32**(2): 132. 1921) used the name *Urceolaria exotica* to apply to the Lesser Antillean *Schradera capitata* Vahl, with Montserrat (type locality of *Schradera capitata*) indicated as the type locality, his treatment included two other taxa, mentioned in synonymy, i.e. *Schradera brasiliensis* Mart. and *S. cephalophora* Griseb. As both the Brazilian *S. brasiliensis* and the Cuban *S. cephalophora* are distinct taxa that can be separated from the Lesser Antillean *S. capitata,* Standley's usage of *Urceolaria exotica* perpetuates an uncertain name which includes at least three taxa.

Urceolaria exotica Gmel. is therefore judged to be a nomen confusum, having been used by Standley to include at least three taxa. According to article 69 of the International Rules of Botanical Nomenclature, which is here invoked to apply to the present case, "a name must be rejected if it is used in different senses and so has become a long-persistent source of error."

Vahl's plate of *Schradera capitata* and his description of this taxon (excluding synonymy) fit the taxon encountered in the Lesser Antilles, Dominican Republic, and Puerto Rico. Vahl's plate shows the leaves obtuse at the apex, acutish at the base, with 6–7 lateral nerves, the interior of the corolla-tube pubescent, and the reflexed cucullate appendage of the corolla-lobe at some distance from the apex. Specimens in NY from the Lesser Antillean islands of Guadeloupe, St. Vincent, St. Kitts, St. Nevis, and Martinique, and from the Dominican Republic, and Porto Rico, fit the description and plate of *Schradera capitata.* Although no material has been examined from the island of Montserrat, type locality for *Schradera capitata,* the specimen of *H. H. & G. W. Smith 1741,* collected on the island of St. Vincent, is a good match for the plate of *S. capitata.*

Vahl described *S. capitata* (loc. cit. p. 35) as having leaves "apice obtusa, basi parum acutiora." This variation of the species with the leaves obtuse at the apex is the one most frequently encountered. The base of the leaf-blade in the common variation usually varies from rounded or obtuse to subacute. Rarely, however, the apex may become acute to subacuminate, while the base of the leaf-blade is acute to subacute. This latter variation has been found on the island of Dominica and may be indicated as **Schradera vahlii** var. **acutifolia** Steyermark, var. nov.

A var. *vahlii* foliorum laminis anguste ellipticis vel lanceolato- vel oblongo-ellipticis 5.5–10 cm longis 2–4.8 cm latis apice plerumque acutis vel subacuminatis interdum obtusis basi acutis vel subacuminatis.

DOMINICA. Vicinity of Fresh Water Lake, near Laudat; edge of low forest; alt. 450–600 m; epiphytic shrub; corolla white; 26 Mar 1956, *A. C. Smith 10289* (holotype NY, isotype US); Laudat; calyx green, fleshy; 1903; *Francis E. Lloyd 185* (paratype NY).

Excluded Species

Schradera ligularis Rudge, Pl. Guian. **1**: 29. *t. 45*. 1805. = *Cephaelis* (?) sp.

The plate shows a head of terminal flowers on an elongated peduncle, but surrounded by about eight distinctly free, elongate, narrowly lance-linear, long-acuminate bracts. These are not united into a common involucre, a character of the genus *Schradera*. It is probable, as Standley judged, that the species should be relegated to the genus *Cephaelis*.

Schradera longifolia Spruce ex Hook. f. in Hook. Ic. Pl. 1870. *t. 1068*. 1870. = *Stachyarrhena longifolia* (Spruce) Hook. f. in Hook. Ic. Pl. *t. 1068*. 1870.

Schradera spicata Spruce ex Hook. f. in Hook. Ic. Pl. 1870. *t. 1068*. 1870. = *Stachyarrhena spicata* (Spruce) Hook. f. in Hook. Ic. Pl. *t. 1068*. 1870.

Schradera umbellata Presl, Bot. Bemerk. p. 81. 1844.

To be excluded because of the four-bracted involucre, four-rayed umbels, and uni-ovulate cells of the ovary. Standley states (Field Mus. Nat. Hist. Bot. **13**(6): 75. 1936) that "the plant is referred with doubt to this genus by Presl. I suspect that it may be a species of *Cephaelis*." Without an examination of the type, the generic position of this plant is uncertain. Because of the characters indicated above, it cannot be maintained in the genus *Schradera*, as that genus is presently understood.

FEB 1964 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN **10**(5):279–304

TAXONOMY OF THE SUBGENUS PTERODES, GENUS LUZULA [1]

John E. Ebinger [2]

Eastern Illinois University, Charleston, Illinois

The monocotyledonous genus *Luzula* comprises a wide ranging group of grass-like plants having little economic importance except as occasional weeds. The common name, woodrush, alludes to the characteristic habitat of shady woodlands, which contrasts with the habitat of many other members of the family Juncaceae. As generally treated, some 60 species are recognized, and these occur on all the major land masses of the world, being particularly abundant in Europe and Central Asia. No recent revision of the genus is available, the last comprehensive treatment being that of Buchenau (1906). During the past half century, numerous species and varieties have been described as new. Moreover, since the discovery of unusual nuclear phenomena in this genus, extensive cytological studies have been carried out with many members of the genus. Unfortunately little or no effort has been made to correlate these results with the taxonomy. In view of the above, along with frequent difficulties encountered in attempting precise identification, a thorough taxonomic study seemed desirable.

For more than a century the genus *Luzula* has been treated as comprising three rather well defined subgenera. These were originally described by Grisebach (1844) and their validity has been generally accepted since that time. Furthermore, present anatomical information compiled by the author as well as recent cytological findings indicate that these three traditional subgenera should be recognized. In this article one of these subgenera (*Pterodes*) has been studied critically and a taxonomic revision is included. An attempt has been made to account for every published name applied to this group from 1753 to the present date. In all cases the original description of each taxon was consulted, and whenever possible, the type specimen was examined. The subgenus *Pterodes* was chosen for critical revision since a great deal of cytological data were available. Also, breeding experiments involving most of the species were conducted by Nordenskiöld (1957) and in the present study an attempt will be made to correlate these results with the taxonomy.

During this study it was necessary to propose new names for some of the taxa studied. In other instances names that had earlier been considered valid have been reduced to synonymy. One new subgeneric name has been used. The subgeneric name *Luzula* is used in place of the earlier name *Gymnodes* to conform to the International Code of Botanical Nomenclature (1956), Article 22.

---

[1] The present contribution is based in part on a thesis presented in June, 1961, to Yale University in partial fulfillment of the requirement for the degree of Doctor of Philosophy.

[2] The author expresses his sincere thanks to Dr. John R. Reeder, as senior advisor, for his assistance and valuable suggestions. He is also indebted to the curators of the many herbaria who sent herbarium specimens to be studied and to Dr. Hedda Nordenskiöld, Agricultural College of Sweden, Uppsala, who kindly sent specimens of the parental plants and hybrids used by her while conducting breeding experiments in the subgenus *Pterodes*.

Each species and variety of the subgenus *Pterodes* is described and whenever possible the type specimen is listed. After the type, a list of the natural occurring hybrids is included. In the citation of specimens, herbarium abbreviation listed in the third edition of ''Index Herbariorum'' (Lanjouw and Stafleu, 1959) are used.

GEOGRAPHIC DISTRIBUTION

In general the family Juncaceae is distributed in the cooler regions of the world and the few species found in the tropics grow in the mountains. The genus *Luzula,* which is the second largest in the family, also has the same general distribution. Although the total range of the genus is world-wide, and species are found on all the continents, two of the subgenera are much more restricted in their distribution while the third (subgenus *Luzula*) is very wide ranging.

According to Buchenau (1906) the center of distribution of the genus is probably in the mountainous regions of central Asia, and all of the subgenera are represented in this area. The subgenus *Anthelaea* which has the most primitive morphology (i.e. type of inflorescence), and simplest chromosome pattern (i.e. diploid species), is almost entirely restricted to the temperate zone of the Northern Hemisphere. Of the 15 species recognized by Buchenau (1906) most of these are found in Europe and central Asia with a few species in the islands off the west coast of Africa. The remaining species of this group are found in eastern Asia and North America with one species, *Luzula gigantea,* extending into South America.

Of the remaining two subgenera, *Pterodes* is generally restricted to the Northern Hemisphere with one species, *Luzula johnstonii* extending into the mountainous regions of northeastern Africa. The origin of this group is probably in central Europe where two species are found with low chromosome numbers (Nordenskiöld, 1957). In addition, one species is found in eastern North America while the other species of this group are represented in Asia with one, *L. rufescens,* extending into Alaska and northwestern Canada.

The last subgenus, *Luzula,* is the only one that has a world-wide distribution. This subgenus has many species in the Northern Hemisphere, with some extending into Central and South America and a few into Africa and New Zealand.

PHYLOGENY WITHIN THE GENUS LUZULA

Buchenau (1906) treated the genus *Luzula* as comprising three subgenera. Of these, he considered the *Anthelaea* to be the most primitive. He suggested that from this primitive type the other two subgenera (*Pterodes* and *Luzula*) diverged independently. He based his conclusions largely on inflorescence types, and suggested that from the open panicle type of inflorescence found in the subgenus *Anthelaea* the inflorescence types of the other subgenera can be derived. From this open panicle the simple corymbose inflorescence of the subgenus *Pterodes* is formed by a suppression of the pedicels and a loss of all but the terminal flower on each of the major branches of the inflorescence. The compound corymb found in some members of this subgenus is probably a remnant of the much branched open panicle. Also, the congested inflorescence of the subgenus *Luzula* can be formed from the open panicle by a shortening of the pedicels until congested spikes are formed on the major branches. A single congested spike could also develop by a further reduction until only a single peduncle remains.

Some information concerning the interspecific relationships of the species can be determined by hybridization and the fertility of the F_1 progeny. Breeding experiments conducted by Nordenskiöld (1957) show to some extent the relationship of the species in the subgenus *Pterodes* by the amount of fertility of the F_1 hybrids. However, even with this information it is usually impossible to tell in which direction evolution is taking place, because most of the crosses produced sterile F_1 hybrids.

The size of the chromosomes and polyploidy are probably the most important characters for determining phylogenetic relationships within the genus. This is due to the diffuse nature of the centromere which is characteristic of the chromosomes of this genus. In contrast, in most plants and animals the chromosomes have a localized centromere which is necessary for the movement of the chromosomes to the poles of the spindle at anaphase of mitosis and meiosis. X-ray experiments have shown that fragments of chromosomes which lack a centromere region are usually eliminated in the course of a division cycle. Therefore, the localized centromere was commonly considered to be a universally occurring structure of the chromosome until Schrader (1931) demonstrated the existence of the diffuse or spreading nature of the centromere for the X-chromosome of the insect *Protortonia primitiva*. The existence of diffuse centromere activity in plants was not known until Malheiros and de Castro (1947) discovered its occurrence in the family Juncaceae. They observed that during somatic division the chromosomes are arranged at right angles to the axis of the spindle during metaphase and at anaphase the chromosomes separate parallel to each other. It was also observed that the chromosome ends are slightly turned to the poles, in sharp contrast to the normal V-shaped configuration characteristic of chromosomes with localized centromeres. During both divisions of meiosis the chromosomes perform the movement to the poles in the same manner as in somatic divisions.

Due to the diffuse nature of the centromere in the genus *Luzula*, chromosome size as well as chromosome number can be used in determining phylogeny. About one-third of the species determined are characterized by a somatic chromosome number of 12. These chromosomes are essentially the same size in the cell and are about 1–2 μ long and 0.5 μ wide when on the metaphase plate. The chromosome number of the other species of the genus are more numerous. The origin of these high numbers has not been determined with certainty, but probably they evolved in two different ways. Nordenskiöld (1951) reports that within the genus three different chromosomal deviations from the standard pattern ($2n = 12$) can be traced. These deviations usually form a polyploid series and all numbers reported conform to one of these series.

The first type is an ordinary polyploid series in which the standard chromosome complement ($2n = 12$) is doubled twice, three or four times to form tetraploids, hexaploids or octoploids. These polyploidal species having chromosomes of about the same size as those of the standard chromosome have been referred to as the AL-type by Nordenskiöld (1951). According to her, it seems very unlikely that all of the species arose by a repeated doubling of the chromosomes in the same manner as an ordinary polyploid series. Even though the chromosome numbers of these species conform to the multiple series of the genus, the difference in size is too large to make this possible. Therefore, Nordenskiöld (1951) suggested the possibility of another series.

This second type of chromosomal deviation is a type of polyploid in which the chromosome size regularly decreases when the number of chromosomes increase. When the chromosome number is doubled from 12 to 24, the size of the chromosome is reduced to about half that of the standard length (AL-type). These smaller chromosomes are referred to as the BL-type, and are about 0.6 μ long. Some species also have 48 chromosomes that are about half the size of the BL-type; these are referred to as the CL-type. The chromosomes of the CL-type are almost spherical at metaphase, and average about 0.4 μ in length. This type of polyploidy is referred to as endo-nuclear polyploidy by Nordenskiöld (1951).

The majority of the species studied have essentially the same chromosome size throughout the cell. However, in some species distinct differences in chromosome size are found, a condition often connected with an aneuploid chromosome number. This is the third type of chromosome deviation and results in the replacement of one AL-type chromosome (1.1 μ long) with two chromosomes of the BL-type (0.6 μ long) and two chromosomes of the CL-type (0.4 μ long) replacing one BL-type (1AL = 2BL = 4CL). This type of chromosome deviation has been interpreted as half completed endo-nuclear polyploid. An important feature of endo-nuclear polyploidy is that though the chromosome number is doubled, the DNA value remains the same (chromosome ratio 2:1; DNA ratio 1:1). In contrast, in a normal polyploid series the chromosome number as well as the DNA value is doubled (chromosome ratio 2:1; DNA ratio 2:1).

Present cytological information indicates that the subgenus *Anthelaea* is the most primitive. The simplest chromosome pattern in the genus is found in this group. In this subgenus Buchenau (1906) recognized two distinct morphological groups, and Nordenskiöld (1951) found that the cytology of these two groups also differs. In the first group all of the species studied have a diploid number of 12 and the chromosomes are of the AL-type, while in the second, different chromosome patterns have been reported. These variations are the result of endo-nuclear polyploidy and no aneuploidy or normal polyploidy has been found. In the subgenus *Pterodes* only seven species have been studied cytologically, and no number below 24 has been found. In this subgenus a normal polyploid series does not occur, but endo-nuclear polyploidy as well as aneuploidy exists. No AL-type chromosomes are present and in most species the chromosome numbers reported are the same for anyone species. The subgenus *Luzula,* which is the largest in the genus, is the only one in which all three forms of chromosome variation exists. At present, the only members of the group that have been studied cytologically are the species from the Northern Hemisphere. The numerous species of South America and New Zealand have not been studied.

Geographic distribution is often useful in ascertaining the center of origin. In *Luzula,* this information, correlated with cytological and morphological data, is useful in determining phylogenetic relationships. The subgenus *Anthelaea* is largely restricted to Central Asia and Europe, with a few species extending into North America. In the subgenus *Pterodes,* only three species are found in Europe, but two of these (*Luzula forsteri* and *L. luzulina*) have the lowest chromosome number found in this group. The remaining species have a higher chromosome number, and are distributed throughout the Northern Hemisphere, with one, *L. johnstonii,* in Africa. In contrast, the large subgenus *Luzula,* has a world wide distribution, but has many diploid species in Europe and Central Asia. This suggests that the subgenus *Anthelaea* is the most primitive, and that it originated in Central Asia or Europe. From this complex the subgenera *Pterodes* and *Luzula* then developed independently.

SPECIES CONCEPT

During this study an attempt was made to designate the species by a system which follows traditional nomenclature, yet emphasizes the morphological recognizable units on a geographic basis. The subgenus *Pterodes* can be readily analyzed in this manner since in most cases the species are geographically isolated and, though similar in morphological traits, have some characters that can be used for consistent separation. Only in Central Europe and eastern Asia is more than one species found growing in the same area, and even in these regions the species are ecologically or genetically separated.

As mentioned previously, the breeding experiments in the subgenus *Pterodes* show that sterility barriers exist between most of the species. This further indicates that the subgenus is composed of natural populations that, though closely related, have genetic barriers that inhibit gene flow from one species to another. In this paper these breeding experiments combined with Anderson's (1949) technique for studying introgressive hybridization are used to show the extent to which these species hybridize in nature.

Most species of the subgenus *Pterodes* have a parallel degree of distinctness and only two or three characters are reliable enough to be useful for consistent separation. *Luzula johnstonii*, an endemic plant from the mountainous regions of northeastern Africa, is the only species which possesses a much larger set of unique characters. All the other species of the subgenus are morphologically similar and some natural hybrids have been reported. These hybrids seem to be completely sterile and have only been found between members of the European complex.

In a few instances varieties are found in the subgenus. They were recognized as geographic segregates with very few characters distinguishing them. Also, an intergrading series is present between them but it is small and incomplete. The term variety is used in place of subspecies because though the taxa seem to be geographically separated they show no ecological preference. Furthermore, the International Code of Botanical Nomenclature allows for the use of either term and in this subgenus it would not have been possible to use both categories.

SYSTEMATIC TREATMENT

Luzula subgenus **Pterodes** Griseb.

Subg. *Pterodes* Griseb. Spicil. Fl. Rumel. Bithyn. **2**: 404. 1844.
Subg. *Anthelophora* Kock, Linnaea 21: 625. 1848.
Subg. *Vernales* Beurl. Bot. Not. **4**: 54. 1853.
Subg. *Corymbophora* Doll, Fl. Grossherzogthums Baden. **1**: 322. 1857 (in part).
Nemorinia Fourr. Ann. Soc. Linn. Lyon, NS. **17**: 172. 1869 (as genus).

Plants perennial, caespitose to stoloniferous; leaf apex callose-tipped, sometimes a short mucronate projection extending from the callose; inflorescence a simple or compound corymb (decompound in one species); flowers solitary at the ends of the pedicels; seeds with a distinct chalazal caruncle; no hairs connecting the seed to the costa.

Buchenau (1906) lists nine species and one variety in this group. In the present treatment eight species and five varieties are recognized.

Type. Grisebach (1844) lists two species as belonging to this subgenus, but designated no type. The first species listed, *Luzula forsteri,* should be considered the type of the subgenus.

Key to the Species

1. Inflorescence usually decompound; pedicels erect to slightly spreading, never reflexed; caruncle small, 0.4 mm long or less, obtuse, erect. 3. *L. johnstonii.*
1. Inflorescence simple or compound; pedicels erect to reflexed; caruncle more than 0.4 mm long, erect or hooked.
  2. Leaf with a small mucronate projection extending from the callose tip; flowers 3.5–4.5 mm long.
    3. Caespitose, or with short rhizomes; inflorescence compound; pedicels erect to slightly spreading; fruit shorter to just equalling the perianth; caruncle erect, less than 0.8 mm long. 2. *L. forsteri.*
    3. Stoloniferous; inflorescence commonly simple, pedicels spreading to reflexed; fruit exceeding the perianth; caruncle erect to slightly curved, 1–1.5 mm long. 4. *L. luzulina.*
  2. Leaf without a mucronate projection on the callose tip.
    4. Plants stoloniferous; cauline leaves tapering abruptly to the callose tip. 7. *L. rostrata.*
    4. Plants stoloniferous or caespitose; the cauline leaves tapering gradually to a callose tip.
      5. Perianth 1.6–2.5 mm long; inflorescence simple to rarely slightly compound; pedicels spreading. 8. *L. rufescens.*
      5. Perianth over 3.0 mm long; inflorescence usually strongly compound; pedicels erect to spreading.
        6. Plants caespitose, occasionally with short rhizomes and stolons, to 3 cm long.
          7. Plants caespitose; culm leaves 1–3 mm wide, to 4 cm long; perianth 3–4 mm long; anthers usually twice as long as the filaments; caruncle about 0.8 mm long, curved. 5. *L. pilosa.*
          7. Plants caespitose or with short rhizomes and stolons; culm leaves 2–8 mm wide, to 7 cm long; perianth 3.5–4.3 mm long; anthers half as long to longer than the filaments; caruncle 1–1.5 mm long, erect or hooked. 6. *L. plumosa.*
        6. Plants strongly stoloniferous. 1. *L. acuminata.*

1. **Luzula acuminata** Raf.

Perennial; rhizomes and stolons present, the rhizomes usually shorter, but similar to the stolons in other characters, stolons to 6 cm long, 1–2 mm wide; blades of the basal leaves, 3–10 mm wide, to 30 cm long; margins sparsely pubescent, apex callose-tipped; culms erect, slender, smooth, 20–40 cm tall, bearing 2–4 leaves; sheaths closed, pubescent at the throat with long white hairs; blades linear 2–4 (rarely 5) mm wide, to 6 cm long, margins sparsely pubescent to glabrous; inflorescence terminal, simple to compound, never decompound; pedicels 8–18, loosely ascending, spreading or nodding, 1–4 cm long; basal bract erect, shorter than the inflorescence, leaf-like, green, the margins sparsely pubescent, callose-tipped; other bracts of the inflorescence smaller, light brown to hyaline flected with brown; inner bract at the base of each pedicel usually truncate with a hyaline tip, glabrous to rarely pubescent; the outer bract half as long to as long as the inner, acuminate, margins pubescent; bracteols ovate-lanceolate, truncate to acute, brown with hyaline margins to completely hyaline, shorter than the flower; perianth segments similar, broadly lanceolate, pale brown to stramineous with hyaline margins, entire, 3–4.5 mm long; stamens 6 shorter than the perianth, filaments linear, white, anthers linear usually twice as long as the filaments; pistil erect, ovary trigonous pointed, style 1–1.5 mm long filiform, stigmas 3, spreading 1.5 mm long; fruits equalling to slightly longer than the perianth, acute, persistent base of the style present, light brown to stramineous; seeds subglobose, purple to brown, 1–1.5 mm long; caruncle large, slightly curved, 1–1.5 mm long.

Key to the Varieties

1. Inflorescence simple, or if compound the ratio of secondary pedicels to primary pedicels less than 0.3, usually no more than one secondary pedicel on any one primary pedicel. var. *acuminata.*
1. Inflorescence compound, the ratio of secondary pedicels to primary pedicels always greater than 0.3, usually two or more secondary pedicels on some of the primary pedicels. var. *carolinae.*

1a. **Luzula acuminata** Raf. var. **acuminata**

Luzula acuminata Raf. Autikon Bot. 193. 1840.
Luzula pilosa (L.) Willd. var. ***americana*** Schultes & Schultes, Syst. Veg. **7**: 262. 1829.
Luzula pilosa (L.) Willd. var. *β*. Hook. f. Fl. Bor. Am. **2**: 188. 1840.
Luzula saltuensis Fern. Rhodora **5**: 195. 1903.
Juncoides saltuense (Fern.) Heller, Muhlenbergia **6**: 12. 1910.
Juncoides pilosum (L.) Coville var. *saltuense* (Fern.) Farwell, Rep. Mich. Acad. Sci. **20**: 170. 1918.
Luzula carolinae S. Wats. var. ***saltuensis*** (Fern.) Fern. Rhodora **40**: 404. 1938.
Juncoides pilosum (L.) Coville var. *michiganense* Farwell, Rep. Mich. Acad. Sci. **20**: 170. 1918.

This taxon has a much more northern distribution than var. *carolinae*. It ranges from southern Canada, through New England States, and into the northern Midwestern States (Fig. 1). It is easily separated from the more southern variety by the general lack of secondary pedicels in the inflorescence. In specimens where secondary pedicels do occur, the ratio is always less than 0.3 and rarely is there more than one secondary pedicel to a primary one.

Type. In the original description no type was designated and no specimens listed. Boreal America was mentioned as the type locality.

Representative Specimens. UNITED STATES: South Dakota: *E. J. Palmer 37562* (GH). Minnesota: *Britters & Abbe 10* (GH); *J. W. Moore 21601* (US); *J. B. Moyle 387* (US); *Pease & Bean 26387* (GH); *Rosendahl & Butlers 4614* (GH). Iowa: *Thorne 10005* (US). Wisconsin: *Colby 4472* (US); *Fassett 2751* (GH), *2744* (GH). Michigan: *Farwell 2559* (GH), *4817* (GH), *4864* (GH), *5421* (GH). New York: *A. J. Eames 290* (GH); *Haberer 962* (GH); *House 8817* (GH), *9346* (GH), *21354* (GH), *22402* (GH); *McVaugh 4066* (GH); *Muenscher & Bechtel 104* (US); *Phelps 282* (GH, US); *Wherry & Muenscher 15308* (GH); *Wiegand 1968* (GH). Pennsylvania: *Fogg 12124* (GH). Maryland: *Herman 14936* (US). Virginia: *Hunnewell 18931* (GH). New Jersey: *Long 31981* (GH), *37425* (GH), *37478* (GH). Connecticut: *Ebinger 90* (YU); *Parker 5492* (YU); *Weatherby 2403* (YU). Massachusetts: *Hill & St. John 1698* (YU). New Hampshire: *Bissell 1498* (YU); *Edmondson 4189* (GH); *A. H. Moore 3408* (US). Maine: *Fellows 1768* (US), *2368* (US); *Fernald 85* (GH, US, YU), *2510* (GH); *Ricker 180* (US); *St. John & Nichols 2203* (YU, US). Indiana: *Deam 44268* (GH). CANADA: Ontario: *Hosie, Losee & Bannan 1512* (GH); *Dutilly & Lepage 36312* (US); *Montgomery 1069* (GH); *Scoper 2652* (GH). Quebec: *Chrysler 1181* (US); *Collins, Fernald & Pease 5462* (GH); *Dutily & Lepage 15036* (GH); *Rouleau 1689* (GH); *Rousseau 26216* (GH, US); *St. John 1824* (GH); *Marie-Victorin 28491* (GH); *Marie-Victorin & Rolland-Germain 25793* (GH, US), *27115* (GH), *27117* (GH), *29264* (GH), *45674* (GH), *49459* (GH). Prince Edward Island: *Fernald & St. John 10988* (GH). Nova Scotia: *Bissell & Linder 20733* (GH); *Fernald & Long 23583* (GH); *Long & Linder 20732* (GH), *20735* (GH); *Nichols 79* (YU), *542* (YU, GH); *Pease & Long 20734* (GH, US). Newfoundland: *Pease & Edgerton 27216* (GH).

Hybrids. No hybirds have been found between this taxon and any other member of the genus. The natural range of this taxon does not overlap that of any other member of the subgenus *Pterodes*.

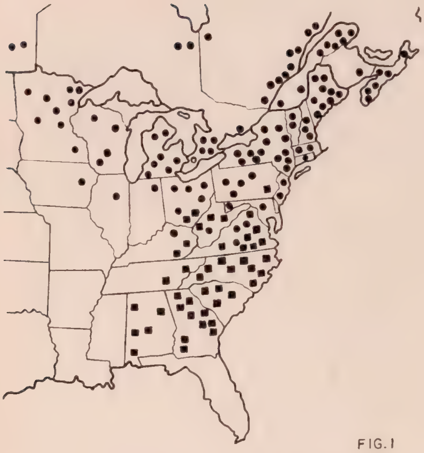


FIG. 1

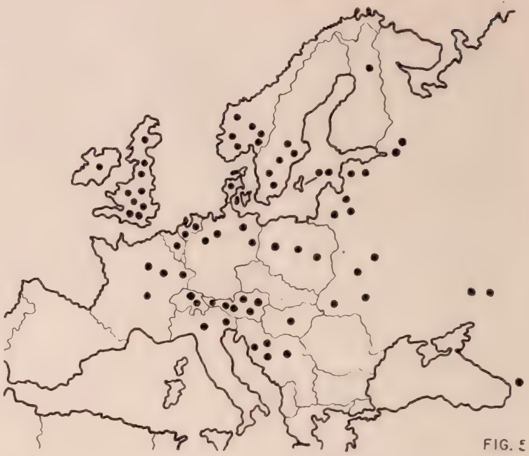


FIG. 5

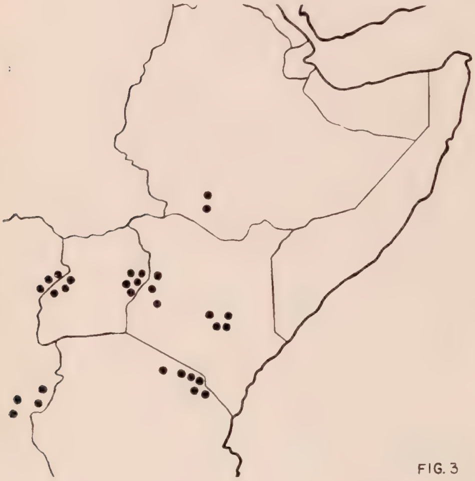


FIG. 3

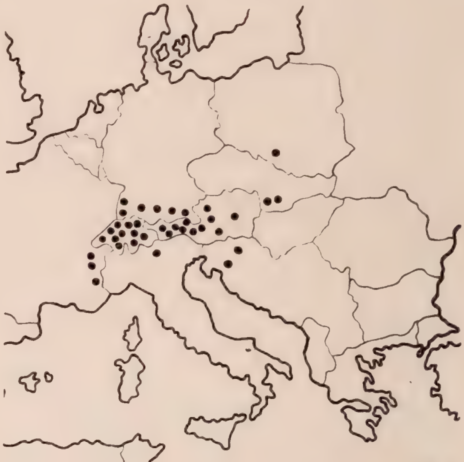


FIG. 4

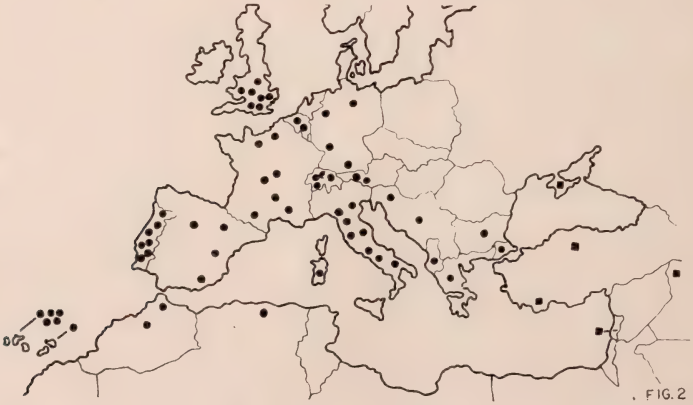


FIG. 2

FIGS. 1–5. FIG. 1. Map of eastern North America showing the distribution of *Luzula acuminata* var. *acuminata* (●) and *Luzula acuminata* var. *carolinae* (■). FIG. 2. Map of Europe showing the distribution of *Luzula forsteri* var. *forsteri* (●) and *Luzula forsteri* var. *rhizomata* (■). FIG. 3. Map of northeastern Africa showing the distribution of *Luzula johnstonii* (●). FIG. 4. Map of Central Europe showing the distribution of *Luzula luzulina* (●). FIG. 5. Map of Europe showing the distribution of *Luzula pilosa* (●).

1b. **Luzula acuminata** Raf. **carolinae** (S. Wats.) Fern.

Luzula acuminata Raf. var. *carolinae* (S. Wats.) Fern. Rhodora **46**: 5. 1944.
Luzula carolinae S. Wats. Proc. Am. Acad. **14**: 302. 1879.
Juncoides carolinae (S. Wats.) O. Ktze. Rev. Gen. Pl. **2**: 724. 1891.

This variety has a more southern distribution than variety *acuminata*. It is found on the coastal plains from Maryland to Georgia and west to Alabama (Fig. 1). It can be distinguished from the more northern entity (*acuminata*) by the numerous secondary pedicels in the inflorescence. Also, some of the primary pedicels have two or more secondary pedicels radiating from them.

Type. *Gray* and *Carey;* July, 1841; growing on Grandfather Mountain in North Carolina. (GH—holotype.)

Representative Specimens: UNITED STATES: Alabama: *Harper 3703* (GH, US), *3956* (US). Georgia: *Allard 81* (US), *82* (US); *Cronquist 4979* (GH); *D. Eyles 6863* (GH); *Harper 2056* (GH, US); *Hermann 10186* (GH); *Muenscher & Smith 2954* (GH). South Carolina: *House 1847* (US); *E. J. Palmer 35405* (GH). North Carolina: *Correll 5020* (GH); *Godfrey 3414* (GH), *3814* (GH); *Godfrey, Campana & Fox 48070* (GH); *Godfrey & Fox 50307* (GH); *Godfrey, Fox & Woods 49111* (GH); *Godfrey & White 7013* (GH, US); *Gray & Carey* (July, 1841) (G—HOLOTYPE); *House 4130* (US); *Hunnewell 10272* (GH), *14188* (GH). Tennessee: *Hunnewell 15158* (GH); *Nease 194* (US). Kentucky: *Mcinter & Shacklette 615* (US). Ohio: *Leonard 551* (US), *552* (US). West Virginia: *Dickey 244* (GH); *Fosh 1034* (US). Virginia: *Fernald & Long 6958* (GH), *6959* (GH), *6960* (GH), *6961* (GH), *6962* (GH), *7787* (GH), *7788* (GH), *14526* (GH); *Fernald, Long & Able 14123* (GH); *Fernald, Long & Pease 11657* (GH, US), *11658* (GH); *Grimes 3400* (GH).

Hybrids. None have been reported, and none were found during this study.

Luzula acuminata is confined to the eastern United States and Canada where it is of rather sporadic occurrence. This early blooming species is usually restricted to moist woodlands but is occasionally found along roadsides and in other open areas. The breeding experiments conducted by Nordenskiöld (1957) indicate that *L. acuminata* is more closely related to *L. pilosa* and *L. plumosa* than to any other member of the subgenus. A close morphological similarity also exists between these three taxa. There are, however, a few traits that can be used to separate them. In *L. acuminata* the capsule tapers gradually to a tip, the perianth segments are usually light colored and soft textured, and the plants are stoloniferous. In contrast, *L. pilosa* and *L. plumosa* have a blunt capsule, the perianth segments are usually dark colored and of a hard texture and the plants are usually strongly caespitose.

There has been a difference of opinion concerning the treatment of the *Luzula acuminata* complex. Some authors have treated this complex as one species, others as two species and others as varieties of one species. In most instances the two entities are recognized as varieties and both Fernald (1950) and Gleason (1952), in the two major floras of the northeastern United States, treat the species in this manner. In both cases the two varieties are separated on the basis of the number of secondary pedicels in the inflorescence. In contrast, Hermann (1946) in a checklist of the plants of the Washington-Baltimore area, and Strausbaugh and Core (1952), in their flora of West Virginia, accept the name *L. acuminata* but do not list variety *carolinae* even though it is undoubtedly found in these areas. Jones (1950) in the flora of Illinois refers to this species as *L. saltuensis*. By using this name, Jones by implication also accepts *L. carolinae* as a valid species because the latter is the earlier binomial. It must also be inferred that he considers the name *L. acuminata* as being invalid since this name was published much earlier than *L. saltuensis*. Also, Fasset (1957) dis-regards the name *L. acuminata* but uses *L. carolinae* var. *saltuensis* for the species found in Wisconsin. These two varieties are discussed more thoroughly by Ebinger (1962b).

2. **Luzula forsteri** (Smith) DC. in Lam. & DC.

Perennial; caespitose, rarely short rhizomes are present, to 4 cm long, 2–3 mm wide, having dark brown to purple scale-like leaves and slender adventitious roots; blades of the basal leaves flat, 1–3 mm wide, to 20 cm long, margins sparsely pubescent, apex callose-tipped wth a mucronate projection extending from it; culms erect, slender, smooth, 20–40 cm tall, bearing 2–4 leaves; sheaths closed, pubescent at the throat with long white hairs; blades linear, 1–2 (rarely 3) mm wide, to 8 cm long, margins glabrous to sparsely pubescent, callose-tipped with a mucronate projection; inflorescence terminal, compound; pedicels erect to slightly spreading, never nodding or reflexed; basal bract erect, shorter than to equalling the inflorescence, leaf-like, green, the margins sparsely pubescent, callose-tipped; the other bracts light brown with hyaline margins and tips, much shorter; inner bract at the base of each pedicel, truncate with hyaline tip, glabrous; outer bract equalling the inner, tip acuminate, sometimes extended into a hair-like tip; bracteoles at the base of each flower ovate-lanceolate, acute to obtuse, usually glabrous, light brown with hyaline margins, one third to half as long as the flower; perianth segments similar, equal, lanceolate with long narrow sharp pointed tips, entire, light brown to black with hyaline margins, 3.5–4.5 (rarely 5.0) mm long; stamens 6 shorter than the perianth, filaments linear white, anthers linear equalling or longer than the filaments; pistil erect, ovary three angled, style filiform 1.5 mm long, stigmas erect 3.0 mm long; fruit shorter than to barely equalling the perianth, acute, usually light brown; sometimes stramineous; seeds 1.3 mm long, dark brown to black; caruncle at apex, erect, obtuse, 0.6 mm long or less.

Key to the Varieties

1. Rhizomes absent, or if present, very short and not exceeding 1 cm in length. var. *forsteri.*
1. Rhizomes present, usually 3 to 4 cm long and 2 mm in width. var. *rhizomata.*

2a. **Luzula forsteri** (Smith) DC. in Lam. & DC. var. **forsteri**

Luzula forsteri (Smith) DC. in Lam. & DC. Syn. Plantarum 150. 1806.
Juncus forsteri Smith, Fl. Brit. **3**: 1395. 1804.
Luciola forsteri (Smith) Smith, Engl. Fl. **2**: 179. 1824.
Nemorinia forsteri (Smith) Fourr. Ann. Soc. Linn. Lyon, NS. **17**: 172. 1869.
Juncodes forsteri (Smith) O. Ktze. Rev. Gen. Pl. **2**: 724. 1891.
Juncoides forsteri (Smith) Druce, Fl. Oxfordshire 2 ed. 434. 1927.
Luzula decolor Webb & Berthelot, Hist. Nat. Iles Canaries **3**: 350. 1849.
Luzula barrelieri Pourr. ex Lange in Will. & Lange, Prod. Fl. Hisp. **1**: 186. 1861. (as a synonym of *L. forsteri.*)
Luzula gesneri Bubani, Fl. Pyren. **4**: 170. 1901.
Luzula forsteri (Smith) DC. var. *pallida* Parl. Fl. Ital. **2**: 295. 1852.
Luzula forsteri (Smith) DC. var. *flaccida* Ascher. & Graebn. Syn. Mitteleur. Fl. **2**: 493. 1904.
Luzula forsteri (Smith) DC. var. *atrifusca* Ascher. & Graebn. Syn. Mitteleur. Fl. **2**: 493. 1904.

In this variety very short rhizomes are sometimes present, but usually the plant is caespitose, and mature fruiting specimens are usually 30 to 40 cm tall.

The blades of the culm leaves are over 4 cm long and from 1–2 (rarely 3) mm wide. This is a wide ranging variety that extends from the Canary Islands, east through northwest Africa to Greece and north into Germany and southern England (Fig. 2).

Type. Mr. Edw. Forster, jun. In a wood opposite the south front of Hasod house, Cardiganshire. (not seen.)

Representative Specimens: ALBANIA: *Alston & Sandwith 1744* (K). AUSTRIA: *Sauter 1049* (GH, US). BELGIUM: *Heurck & Martinis 290* (K); *A. Lelievre 180* (GH, LISU). BULGARIA: *C. K. Schneider 537* (K). CANARY ISLANDS: *E. Asplund 166* (K); *J. Ball* (March, 1888) (GH); *E. Bourgeau 1554* (K); *R. P. Murray* (May 7, 1902) (K); *Perrandiéré* (April 4, 1855) (GH, US). CORSICA: *M. F. Spencer* (May 30, 1906) (GH). ENGLAND: *E. Armitage 1656* (K); *A. Bennett 1002* (US); *C. R. Billups 1549* (K); *C. B. Clarke* (May 28, 1888) (K), (July 9, 1900) (K), (June 17, 1905) (K); *J. S. Gamble 18768* (K); *Jackson & Green 1656* (K); *J. E. Little 2* (K); *N. Y. Sandwith* (June 5, 1921) (K), (June 18, 1927) (K); *V. S. Summerhayes 1936* (K); *W. B. Waterfall 1352* (K); *H. C. Watson 1171* (US); *D. P. Young 3992* (K). FRANCE: *E. Chabert 2639* (LISU); *W. P. Conant* (Oct. 10, 1879) (GH); *A. Ditiglize* (May 30, 1867) (US); *H. H. Iltis 3048* (US); *S. E. Lassimonne* (April, 1892) (US); *F. Raine* (March 21, 1907) (GH); *A. Songeon* (May 12, 1857) (GH); *Vahl* (April, 1825) (US). GERMANY: *Kneucker 55* (GH, K, US); *F. Schultz 154* (K, LISU); *F. von Speissen* (May 10, 1879) (US), (March 24, 1880) (US). HUNGARY: *L. Richter 55* (GH, US). ITALY: *J. Ball* (April, 1842) (GH), (March 23, 1862) (GH), (June, 1863) (GH), (May 9, 1866) (GH), (May 6, 1867) (GH); *A. Beguinot 411* (GH, K); *E. F. Paoletti* (March, 1900) (GH); *H. Ross 687* (GH). PORTUGAL: *J. Daveau* (March, 1882) (LISU); *M. Ferreira 536* (LISU); *A. de C. Freire 183* (LISU); *A. Moller 56* (LISU, US), (March, 1879) (LISU); *C. Romariz 39* (LISU), *860* (LISU), *869* (LISU); *M. Winkler* (May 8, 1876) (K). SPAIN: *N. Y. Sandwith 5258* (K), *5286* (K); *F. Spennen* (March, 1920) (K); *Willkomm 587* (GH). SARDINIA: *P. Thomas* (1828) (US). SWITZERLAND: *Favrat & Barbey* (May, 1872) (K); *R. Masson* (May, 1888) (US). YUGOSLAVIA: *C. Baenitz* (April 21, 1898) (US); *Jackson & Turrill 72* (K).

Hybrids. The only naturally occurring hybrid that has been found during this study is *Luzula forsteri* × *L. pilosa*. This hybrid was first described as a species (*Luzula borreri* Bromf. ex Bab.) by Babington (1851), and later treated as a variety of *L. pilosa* by Syme (1872). Buchenau (1890) realized that this taxon was a hybrid and later botanists have treated it in this same manner.

2b. **Luzula forsteri** (Smith) DC. in Lam. & DC. var. **rhizomata** Ebinger, var. nov.

A var. *forsteri* rhizomatibus 2–4 cm longis; caulibus 20 cm altis; laminis foliorum caulinorum 2–4 mm longis differt.

This variety is similar to variety *forsteri,* but differs in that rhizomes are present. These are to 4 cm long and 2 mm in diameter. The plant is 20 to rarely 30 cm tall, and the culm leaves do not exceed 4 cm in length and 1–2 cm in width. This variety is restricted to the eastern Mediterranean Region (Fig. 2).

Type. *Davis 21536:* Turkey, Cankiri Providence, Ilgav District, Yaylacik; 1000 meters in *Pinus nigra* forest; June 5, 1954. (K.)

Representative Specimens: IRAN: *H. F. Mooney 6625* (K). LEBANON: *O. Polvnin 5325* (K). LESBOS: *C. N. Goulimy* (April 12, 1957) (K). RUSSIA: (Crimea): *C. Golde 1092* (K). TURKEY: *Davis 21536* (K—HOLOTYPE); *D. Heldreich 3550* (K).

Hybrids. None have been reported and none were found during this study.

Luzula forsteri is a wide ranging species that is very distinct and easily distinguished from any other member of the subgenus. Morphologically it is more closely related to *L. plumosa,* from which it differs in the lack of a large hooked caruncle on the seed, and the presence of a mucro on the callose tip of the leaf.

Experiments by Nordenskiöld indicates that genetically *L. forsteri* is most closely related to *L. luzulina.* The F_1 hybrids produced were 80 to 90 percent fertile and some of the F_2 progeny were 100 percent fertile. Present information, however, indicates that these two species do not hybridize in nature. This lack of hybridization is due to a difference in blooming period and ecological conditions that will be discussed more fully under *L. luzulina.*

The only other species which occurs in the same general region and with which *Luzula forsteri* would have an opportunity to hybridize in nature is *L. pilosa.* Both of these species are found in Europe, but *L. pilosa* generally occurs farther north. These species do come into contact, however, and some hybridization takes place. F_1 hybrids between these two species are completely sterile, according to Nordenskiöld's experiments, but Ebinger (1962a) found that this hybrid occasionally sets a few seeds and that it may backcross with one of the parents.

The material that is now considered *Luzula forsteri* was combined with *Juncus pilosus* (= *L. pilosa*) until 1804. Once it was recognized as being specifically distinct, however, this concept was accepted by most botanists. Most of the names attributed to this species are transfers to other genera that are now considered synonyms of *Luzula.* In a few cases, however, the names are later described synonyms (*L. decolor* and *L. gesneri*) or herbarium names (*L. barrelieri*) that were introduced into the literature as synonyms of *L. forsteri.*

Although the variety *forsteri* is relatively constant in its characters, many of the specimens from Spain, Portugal, northwest Africa and the Canary Islands have culm leaves that are wider than is usual for members of this variety. Plants with this characteristic have been referred to as *Luzula decolor* by earlier authors. The variety *pallida,* which is here considered a synonym of *L. forsteri* var. *forsteri,* was described as having flowers that are pale yellow in color. This condition was sometimes found, but seems not to be correlated with a particular locality, but rather represents the normal variation of the species. Variety *rhizomata,* in contrast, has a distinct geographic range, and is easily separated from variety *forsteri* by the presence of rhizomes.

3. **Luzula johnstonii** Buchenau

Luzula johnstonii Buchenau, Bot. Jahrb. **12**: 79. 1890.
Juncoides johnstonii (Buchenau) O. Ktze. Rev. Gen. Pl. **2**: 724. 1891.

Perennial; rhizomes and stolons present, these similar, to 10 cm long, 1–4 mm wide, with purplish scale-like leaves and slender adventitious roots; blades of the basal leaves flat, 3–7 mm wide, to 20 cm long, margins sparsely pubescent, apex mucronate acuminate or callose-tipped; culms erect, slender, smooth, 20–40 cm tall, bearing 2–4 leaves; sheaths closed, pubescent at the throat with long white hairs, blades linear, 3–6 mm wide, to 9 cm long, margins sparsely pubescent, callose-tipped; inflorescence terminal, decompound; pedicels erect to slightly spreading, never reflexed; basal bract erect, much shorter than the inflorescence, leaf-like, green to purple, the margins sparsely pubescent, callose or mucronate-tipped; other bracts purple, shorter; inner bract at the base of each pedicel usually truncate with a hyaline tip, sometimes pubescent; outer bracts usually longer than the inner, tip acuminate, sometimes extended into a slender hair-like tip; bracteoles ovate-lanceolate, acuminate, awned, purple with hyaline margins, shorter than the flowers; perianth segments similar, equal, lanceolate, entire, usually awned or the petals frequently unawned, purple with narrow hyaline margins, 3–4.5 mm long; stamens shorter than the perianth, filaments linear white, anthers linear usually shorter than the filaments; pistil erect, ovary trigonous, style filiform 1 mm long, stigmas 3 erect 2–3 mm long; fruit equalling the perianth or shorter, apex extended by the persistent base of the style, usually light purple (sometimes stramineous); seeds 1.5 mm long, purple to black; caruncle at apex, erect, obtuse, 0.4 mm long or less.

Type. *H. H. Johnston 28*, collected in 1884 in Kenya on Mt. Kilimanjaro at an elevation of 8000–9000 feet. (K.)

Representative Specimens: BELGIAN CONGO: *Beguaert 3759* (US); *Chapin 120* (US); *Humbert 8899* (US); *Linder 2301* (GH); *Scaetta 1596* (K); *Tebrum 416* (K). ETHIOPIA: *Gillet 14922* (K); *Monney 7164* (K). KENYA: *Bally 130* (K); *Bogdam 4128* (K); *R. & T. Fries 1257* (K); *O. Hedberg 213* (K), *975* (K), *1937* (K); *Johnston 28* (K—HOLOTYPE) *Mearns 1716* (US). TANGANYIKA: *Greeway 3808* (K); *A. E. Haarer 1150* (K); *O. Hedberg 1365* (K); *H. J. Schlieben 4819* (K). UGANDA: *R. A. Dummer 3548* (K); *O. Hedberg 358* (K), *2062* (K); *G. H. Humphreys 522* (K); *Liebenberg 1703* (K); *G. Wood 213* (K).

Hybrids. Because this species is geographically isolated, no naturally occurring hybrids have been found.

Luzula johnstonii is found only in the high mountainous regions of Kenya, Uganda, Ethiopia, Tanganyika and the Belgian Congo (Fig. 3). All of the material studied was collected at an altitude above 8,500 feet principally on Mt. Elgon, Mt. Kenya, Mt. Kilimanjaro and Mt. Ruwenzoi. As a result of this mountainous habitat the populations growing on different mountains are separated from each other, and there is, accordingly, little or no opportunity for interbreeding. Even considering this lack of gene flow the species is uniform and most of the variation that takes place is in flower size and the amount of coloration of the perianth segments. This slight variation is usually found in plants from different mountains, but sometimes occurs in a population from a single mountain.

Morphologically this species is distinct from the other members of the subgenus. The caruncle in *Luzula johnstonii* is very short and obtuse while in the other taxa of the subgenus the caruncles are much larger. Probably the most distinctive feature of this species is the decompound inflorescence. No other member of the subgenus *Pterodes* consistently has a decompound inflorescence, but it is occasionally found in *L. plumosa* var. *reflexa*. Moreover, the nearly erect pedicels of *L. johnstonii* are found only in *L. plumosa* var. *plumosa* and *L. forsteri*.

Because of its distinct morphology and its disjunct distribution, this species has never been confused with any other member of the subgenus. Moreover, because of its uniformity no new specific epithet has been used for this species since it was described by Buchenau (1890). Furthermore, no varieties have been described. The only nomenclature change that has been made was when Kuntze (1891) transferred the species to the genus *Juncodes* because he considered this generic name to be the valid name of the genus.

Although many morphological features separate this species from the others in the subgenus, Nordenskiöld (1957) discovered that *Luzula johnstonii* will form hybrids with most of the subgenus *Pterodes*. In these breeding experiments *L. johnstonii* was crossed with the North American species *L. acuminata* and the Asian species *L. plumosa* and sterile F_1 hybrids were obtained. Crosses between *L. johnstonii* and the European species *L. luzulina*, *L. forsteri*, and *L. pilosa* resulted in partially fertile F_1 hybrids and some F_2 plants were even obtained. Evidently, then, *L. johnstonii* is most closely related to the European members of the subgenus. Its morphological characters also resemble those of the European species more than any other members of the subgenus.

4. **Luzula luzulina** (Vill.) Dalla Torre & Sarnth.

Luzula luzulina (Vill.) Dalla Torre & Sarnth. Fl. Tirol **6**: 426. 1906.
Juncus luzulinus Vill. Hist. Pl. Dauph. **2**: 235. 1787.
Juncodes luzulinum (Vill.) O. Ktze. Rev. Gen. Pl. **2**: 724. 1891.
Juncus flavescens Host, Gram. Austr. **3**: 62. 1805.
Luzula flavescens (Host) Gaudin, Agrost. Helv. **2**: 239. 1811.
Nemorinia flavescens (Host) Fourr. Ann. Soc. Linn. Lyon, NS. **17**: 172. 1869.
Luzula hostii Desv. Jour. Bot. Desvaux **1**: 140. 1808.
Luzula hostii Desv. var. *murrea* Fourn. Monde Pl. **205**: 4. 1934.
Luzula murrea (Fourn.) Fourn. Monde Pl. **212**: 12. 1935.
Luzula pallescens Hoppe, Flora **2**: 185. 1819.
Luzula callosa Raf. Autikon Bot. 193. 1840.
Luzula pubescens Schrank, Flora **2**: 446. 1819.
Juncus pallescens Schrank, Flora **2**: 445. 1819. nom. nud.
Juncus pedatus Jacq. ex Schultes & Schultes, Syst. Veg. **7**: 264. 1829 (as synonym of *Luzula flavescens*).

Perennial; with stolons, to 8 (sometimes 15) cm long, 1 mm wide, with dark brown scale-like leaves and slender adventitious roots; blades of basal leaves flat, to 15 cm long, 3–6 mm wide, margins glabrous to sparsely pubescent, apex callose-tipped with a mucronate projection extending from it; culms erect to slightly ascending, slender smooth, 20–30 cm tall, bearing 2–3 leaves; sheaths closed, glabrous to slightly pubescent at the throat, blades linear 2–3 mm wide, to 5 cm long, margins glabrous to sparsely pubescent, callose-tipped with a short mucronate extension; inflorescence terminal, simple (rarely a few secondary pedicels are present); pedicels 4–7, spreading to reflexed; basal bract erect, shorter than the inflorescence, leaf-like, the margins usually glabrous, usually mucronate tipped; other bracts light brown, with or without hyaline margins; inner bract at the base of each pedicel usually truncate with a hyaline tip, sometimes pubescent; outer bract usually equalling the inner, tip acuminate; bracteoles ovate-lanceolate, acuminate, awned, light brown with hyaline margins, shorter than the flower; perianth segments similar, equal, lanceolate, entire, with a long slender tip, brown to stramineous, 3.5–4.5 (rarely 5.0) mm long; stamens 6 shorter than the perianth, filaments linear white, anthers linear longer than the filaments; pistil erect, ovary three angled to round, style filiform 1 mm long, stigmas erect 3 mm long; fruit exceeding the perianth, to 6.0 mm long, rostrate, apex with the persistent base of the style, light brown to stramineous; seeds dark brown to black, 1.5 mm long; caruncle erect to slightly curved, 1.0 mm long to as long as the seed.

Type. In the original description no type is designated and no specimens are listed. It is described in ''Histoire des Plantes de Dauphine.'' Dauphine is a former province of southeastern France, therefore this region is probably the type locality of this species.

Representative Specimens: AUSTRIA: *E. Asplund* (May 18, 1927) (US); *J. Ball* (July 4, 1863) (US), (July 19, 1867) (GH), (May, 1874) (US); *Fauhini* (May, 1852) (K); *Görz* (July 8, 1914) (GH); *R. Huter* (June 20, 1865) (K); *E. Palla 89* (GH, US). CZECHOSLOVAKIA: *Domin & Suza 332* (GH, US); *V. Krajina 333* (GH, K, US). FRANCE: *J. Gay* (June 25, 1830) (US); *A. Songesn* (June 14, 1862) (US). GERMANY: *F. G. Strobl* (June & July, 1868) (K), (May 25, 1869) (K), (June 2, 1869) (K); *Traunsteiner 423* (GH, K); *F. Vollmann 1436* (GH, K). ITALY: *Rohlena* (Aug. 1923) (K). POLAND: *Bulandzianka, Pawłowski & Walas 80* (GH, K). SWITZERLAND: *J. Ball* (Aug. 1883) (G); *C. Brugger*

(July 14, 1864) (K); *F. Buchenau* (Aug. 1, 1883) (US); *N. S. Clarke* (Aug. 9, 1849) (K); *R. Gross* (July 15, 1931) (US); *E. Michalet 125* (K); *A. R. Paul* (July 8, 1905) (GH); *J. Pfister 1184* (US); *F. Schultz 624* (GH); *Thomas* (July, 1865) (K); *F. O. Wolf 148* (GH, US). YUGOSLAVIA: *Cook, Grubb, Newman & Whitmore 131* (K); *Maly* (June 20, 1934) (K).

Hybrids. The only natural occurring hybrid that has been reported is *Luzula luzulina* × *L. pilosa.* This hybrid was first reported by Brügger (1880) and later by Murr (1930). In the latter instance it was named *L. vinesii.* No hybrids were encountered during the present study. The difference in flowering time between these two taxa would tend to inhibit hybridization, as would their different ecological preference. *L. luzulina* is restricted to mountainous regions of Central Europe where it usually grows above an altitude of 4,000 feet while *L. pilosa* is a much wider ranging species generally found at lower altitudes. No other naturally occurring hybrids have been reported, but this species may occasionally hybridize with *L. forsteri.*

Luzula luzulina is a very distinct species that is restricted to the high mountainous regions of Central Europe (Fig. 4). The long stolons, simple inflorescence, large flowers, and capsules that exceed the perianth distinguish this taxon from the other two species that occur in this area. All specimens that were examined during this study were collected above 4,000 feet, and generally in coniferous forests or small open areas.

Before 1906 this species was referred to as *Luzula flavescens* since most authors were apparently unaware of the earlier name, *Juncus luzulina*, proposed by Villars (1787). Up to this time the floras and monographs of this genus used the name *L. flavescens* and many of the earlier collections still bear this name. In addition to the above, a few other names have also been proposed for this species. Desvaux (1808) named this species *L. hostii* because he considered *Juncus flavescens* to be inappropriate. He remarks "J'ai cru devoir changer le nom de cette espèce, parce qu'elle n'est pas plus jaunâire que la précédente, ni que le suivante." Three other names (*L. pallescens, Juncus pallescens,* and *Juncus pedatus*) are either nomina nuda, or were listed as synonyms of *L. flavescens.*

As mentioned previously, artificially produced hybrids between this species and *Luzula forsteri* resulted in highly fertile F_1 hybrids and F_2 progeny that are sometimes completely fertile. Thus these two species are very closely related, perhaps even subspecies of a single species. However, introgressive hybridization studies between these two taxa suggest that hybrids occur rarely, if ever, in nature. This results because of two peculiarities of these species. First, though the ranges of the two overlap, *L. luzulina* is restricted to the high mountains and alpine regions, usually above 4,000 feet, while *L. forsteri* grows at much lower altitudes. Secondly, there is a difference in blooming period, with *L. forsteri* shedding its pollen in April and early May, while *L. luzulina* usually does not bloom until late May and June. In the other species of the subgenus *Pterodes* sterility barriers have maintained the species as separate entities while between these species no sterility barrier appears to exist. In its place is a different ecological habitat and a difference in flowering time that have accomplished similar results.

5. **Luzula pilosa** (L.) Willd.

Luzula pilosa (L.) Willd. Enum. Hort. Berol. 393. 1809.
Juncus pilosus L. Sp. Pl. 329. 1753.
Luciola pilosa (L.) Smith, Engl. Fl. 2: 178. 1824.

Juncodes pilosum (L.) O. Ktze. Rev. Gen. Pl. **2**: 725. 1891.
Luzula pilosa (L.) Willd. var. *simplex* Sonder, Fl. Hamburgensis 199. 1851.
Luzula pilosa (L.) Willd. var. *prolifera* J. Ch. Doll, Fl. Grossherzogthums Baden **1**: 325. 1857.
Juncus vernalis Reichard, Fl. Moeno-Francof. **2**: 182. 1778.
Luzula vernalis (Ehrh.) DC. in Lam. & DC. Fl. Fr. **3**: 160. 1805.
Juncus pilosus L. var. *vernalis* (Hoffm.) Pers. Syn. Pl. **1**: 385. 1805.
Nemorinia vernalis (Ehrh.) Fourr. Ann. Soc. Linn. Lyon, NS. **17**: 172. 1869.
Juncus luzula Krock. Fl. Siles. **1**: 569. 1787.
Juncus pilosus L. var. *cymosus* Schrank, Baier. Fl. **1**: 622. 1789.
Juncus nemorosus Lam. Encycl. **3**: 272. 1789.
Luzula nemorosa (Lam.) Dulac, Fl. Hautes-pyr. 100. 1867.

Perennial, with very short rhizomes, to 2 cm long, 1–2 mm wide, dark scale-like leaves and slender adventitious roots; blades of basal leaves flat, 5–11 mm wide, to 20 cm long, margins glabrous to sparsely pubescent, apex callose-tipped, without a mucronate projection; culms erect, slender, smooth, 20–40 cm tall, bearing 2–4 leaves; sheaths closed, pubescent at the throat with long white hairs; blades linear, 1–3 mm wide, to 4 cm long, usually only 2 cm, margins glabrous to sparsely pubescent, callose-tipped; inflorescence terminal, compound, usually with numerous secondary pedicels, most of the pedicels nodding or reflexed; basal bract erect, much shorter than the inflorescence, leaf-like, green, margins glabrous to pubescent, callose-tipped; other bracts of the inflorescence light brown to dark brown with hyaline margins; inner bract at the base of each pedicel truncate with a hyaline tip, sometimes pubescent; outer bract usually shorter than the inner, acuminate, pubescent; bracteoles at the base of the flowers ovate-lanceolate, acuminate, light brown with hyaline tip and margins, half as long as the flower; perianth segments similar, equal, lanceolate, entire, usually extended into a slender tip, light to dark brown to black with narrow hyaline margins, 3–4 mm long; stamens 6 shorter than the perianth, filaments linear white, anthers linear usually twice as long as the filament; pistil erect, style filiform 1 mm long, stigmas 3 erect 2–3 mm long; fruit equalling to exceeding the perianth, to 4.5 mm long, tip subtruncate to obtuse, extended into a short tip by the persistent base of the style, stramineous to light brown; seeds 1.5 mm long, dark purple to black; caruncle at apex curved, 0.8 mm to as long as the seed, 0.5 mm wide at the base, yellow.

Type. This species was named by Linnaeus and no type was designated and no specimens listed. However, in the micro-edition of photographs of the specimens of the Linnaean herbarium (International Documentation Center) a specimen was seen that is typical of *Luzula pilosa* and is labeled *Juncus pilosus*. In the opinion of the author this specimen in the Linnaean herbarium should be considered the type of the species.

Representative Specimens: AUSTRIA: *J. Ball* (July, 1877) (GH); *M. E. Edmonds 123* (K); *A. Kneucker 56* (GH, K, US); *L. Meisser 423* (GH); *A. S. Pease 8597* (GH), *13185* (GH). BELGIUM: *Heurch & Martins 289* (K). CZECHOSLOVAKIA: *R. Dolezal 644* (K, US); *J. Otruba 334* (GH, K, US), *773* (US); *J. Petrark 430* (GH). DENMARK: *F. A. Joker* (May, 1925) (GH). ENGLAND: *J. Ball* (April, 1839) (GH), (May 30, 1861) (US), (April, 1876) (US); *C. E. Britton* (May 21, 1893) (K); *B. Burtt 234* (K); *C. B. Clarke 47409* (GH); *C. E. Hubbard 12667* (K); *F. K. Makin 1910* (K); *Redhead 6136* (K); *Redhead & Summerhayes 5402* (K); *W. B. Turrill* (May 23, 1915) (K), (May 2, 1926) (K), (April 20, 1927) (K), (May 1, 1927) (K), (May 1, 1943) (K); *D. P. Young 3993* (K). FINLAND: *Nordholm, Forsblom & Hjelt 155* (K). FRANCE: *C. Billot 134* (US); *S. E. Lassimonne 259* (US); *A. v. Reuss* (June, 1872) (US). GERMANY: *A. Meebold* (April, 1910) (K); *E. M. Reineck* (April, 1902) (GH); *v. Schelling* (April 15, 1913) (GH); *Ziesché* (May 28, 1900) (US). ITALY: *J. Ball* (June, 1872) (US); *Beguinot & Pampanini 410* (GH, K). NETHER-

LANDS: *Geesteranus & van Hattum* (May 21, 1950) (K); *J. T. Koster* (May 23, 1936) (GH); *Reelaire* (May 1, 1898) (K). NORWAY: *O. Anderson* (May 1, 1902) (US), (May 26, 1904) (US); *R. E. Fridtz 1411* (GH); *A. S. Pease* (July 9, 1930) (GH); *S. K. Selland* (July 3, 1902) (GH). POLAND: *Pawłowski 79* (GH, K); *A. Rehder* (May 12, 1882) (GH); *T. Symonowiczówna 488* (S); *J. Trela* (April 29, 1930) (US). ROMANIA: *G. Bujorean 935* (GH, K, US). RUSSIA (western): *H. W. Arnell* (1876) (S); *M. Brenner* (June 17, 1876) (S); *E. E. N. Busch* (Aug. 18, 1928) (S); *Davis 33013* (K); *S. J. Enander* (July 12, 1913) (S); *O. R. Holmberg 2013* (S); *E. Lundstrom 320* (S); *S. Mameev 673* (K, US); *G. Pahnsch* (May 2, 1874) (S); *K. Starcas 6082* (S); *K. Starz 2165* (S); *V. Transchel* (May 9, 1920) (S); *D. Zerow* (May 19, 1929) (S), *35* (S). SCOTLAND: *A. Somerville 1550* (K). SWEDEN: *F. Ahlberg* (June, 1870) (GH); *E. T. Fries* (May, 1906) (GH), (May 28, 1928) (K); *B. Lindner* (April, 1909) (GH); *G. Samuelsson 482* (K); *Simosson & Tidestrom 14672* (US). SWITZERLAND: *A. S. Pease 9332* (GH), *9556* (GH).

Hybrids. The following naturally occurring hybrids have been reported.

L. pilosa × *L. forsteri*—discussed under *L. forsteri*.

L. pilosa × *L. luzulina*—discussed under *L. luzulina*.

L. pilosa × *L. silvatica*—This hybrid was mentioned by Buchenau (1906), and later named *L.* × *Buchenaui* by Fournier (1935). During this study no specimens were found that would indicate that hybridization was taking place between these two taxa.

L. pilosa × *L. nemorosa*—This hybrid was reported as occurring naturally by Domin (1935) who gave it the formal name *Luzula cehica*. In the present study no specimens were found that appeared to be hybrids between these two species.

Luzula pilosa is a wide ranging species found throughout northern Europe (Fig. 5). This taxon is very constant in its morphological characteristics and it did not seem feasible to distinguish varieties or subspecies. However, some variation does exist. Some of the specimens from the northern part of its range tend to have rhizomes that are 2–3 cm long, while these are lacking in the southern plants. However, this character was highly variable, and numerous plants were caespitose, lacking rhizomes altogether. Moreover, some plants were found that had simple inflorescences, but unlike *L. acuminata*, this trait is not constant and cannot be correlated with geographic distribution.

This taxon is easily distinguished from the two other European species (*Luzula forsteri* and *L. luzulina*) and is morphologically more similar to the North American species *L. acuminata*. It can readily be distinguished from this latter species, however, by its caespitose habit, the darker color and harder texture of the perianth segments, and the subtruncate to obtuse capsule tip.

The nomenclature of *Luzula pilosa* is quite complicated, and there are numerous synonyms in the literature. The species was first described by Linnaeus (1753) as *Juncus pilosus*, and later by Reichard (1788) under the name *Juncus vernalis*. This latter name was taken up by most subsequent authors when referring to plants of this species. Most of the synonyms represent the transfer of these two specific epithets (*pilosa* and *vernalis*) to other generic names that are now considered synonyms of the genus *Luzula*. DeCandolle in Lamarck and DeCandolle (1805), in the original description of the genus *Luzula* used the specific epithet *vernalis* for this species, but mistakenly considered Ehrhart (1791) as the author of the name, as did Fourreau (1869) when he transferred this specific epithet to the genus *Nemorinia*. Three other names also have been used for this species (*Juncus luzula*, *J. nemorosus* and *L. nemorosa*) and are here considered as synonyms of *L. pilosa*. Four varieties also have been designated by previous authors, but most of these are minor variants that have no geographical differences and only slight morphological variation. The one exception being var. *prolifera,* which probably represents a diseased or malformed specimen.

6. **Luzula plumosa** Wall. ex E. Mey.

Perennial; caespitose, sometimes rhizomes and stolons present, these similar, but the stolons are longer, to 3 cm long, with dark brown scale-like leaves and slender adventitious roots; blades of the basal leaves flat, 2–6 (rarely 11) mm wide, to 15 (rarely 20) cm long, margins pubescent, apex callose-tipped; culms erect, slender, smooth, 20–40 cm tall, bearing 2–4 leaves; sheaths closed, pubescent at the throat with long white hairs; blades linear, 2–5 (rarely 8) mm wide, to 7 cm long, margins sparsely pubescent, callose-tipped; inflorescence terminal, compound (rarely decompound in var. *reflexa*)*;* pedicels erect to slightly spreading (strongly nodding to reflexed in varieties *reflexa* and *brevipes*)*;* basal bract erect, shorter than the inflorescence, leaf-like, green, margins sparsely pubescent, callose-tipped; other bracts of the inflorescence shorter, light brown to stramineous; inner bract at the base of each pedicel truncate with a hyaline tip, glabrous to pubescent; outer bracts shorter to longer than the inner, tip acuminate, margins pubescent; bracteoles lanceolate, acuminate, glabrous, light brown to stramineous with wide hyaline margins, half as long as the flowers; perianth segments similar, rarely the petals are shorter than the sepals, lanceolate, entire, usually awned or the inner frequently unawned, dark brown to purple with a narrow hyaline margin, 3–4 (rarely 4.3) mm long; stamens 6 shorter than the perianth, filaments linear white, anthers linear half as long to longer than the filaments; pistil erect, style filiform less than 1 mm long, stigmas 3 erect 2 mm long or less; fruits shorter to longer than the perianth, apex extended by a short persistent base of the style, subtruncate to acute, light brown; seeds 1.5 mm long, purple to black; caruncle at apex and side of the seed, erect to strongly hooked, narrow to as wide as the seed, 0.7–1.5 mm long.

Key to the Varieties

1. Basal leaves more than 6 mm wide; inflorescence compound to decompound; caruncle hooked, as long as the seed. var. *reflexa.*
1. Basal leaves less than 6 mm wide; inflorescence compound, never decompound; caruncle strongly hooked to erect, as long as the seed or shorter.
    2. Pedicels erect to slightly nodding, never reflexed; caruncle as long as the seed, hooked. var. *plumosa.*
    2. Pedicels nodding to reflexed; caruncle shorter than the seed, erect to slightly curved. var. *brevipes.*

6a. **Luzula plumosa** Wall. ex E. Mey. var. **plumosa**

Luzula plumosa Wall. ex E. Mey. Linnaea **22**: 387. 1849.
Juncus plumosus Wall. ex E. Mey. Linnaea **22**: 387. 1849. (as a synonym of *L. plumosa.*)
Luzula pilosa (L.) Willd. var. *plumosa* (Wall. ex. E. Mey.) Franchet, Pl. David. **2**: 138, 1888.
Juncodes plumosum (Wall. ex E. Mey.) O. Ktze. Rev. Gen. Pl. **2**: 725. 1891.

This variety is distributed throughout the Himalayan Mountains in northern India, Tibet, Nepal and China (Fig. 6). Most of the specimens examined were collected between 5,000 and 10,000 feet. This variety can easily be distinguished from variety *reflexa* by its narrower leaves and erect to slightly spreading pedicels, and from variety *brevipes* by its erect pedicels and long hooked caruncle.

Type. In the original description no type is listed. However, Meyer mentions that the plant grows in Nepal, and that the name *Juncus plumosus* is from "Wallichii mscr, in Hookeri herbario." A specimen collected in Nepal by D. Wallich that is in the Royal Botanical Garden (K) is labeled *Juncus plumosus*

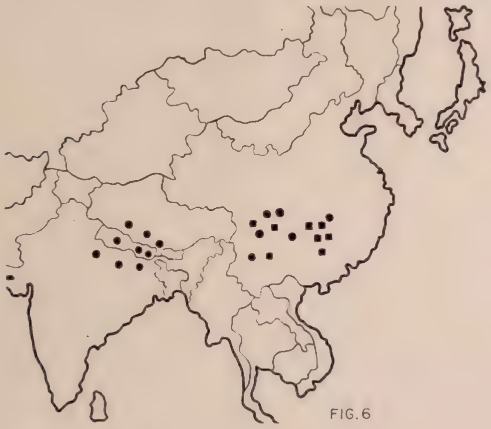


FIG. 6

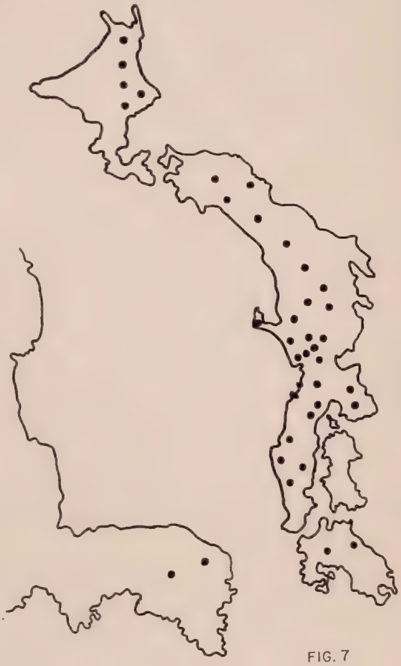


FIG. 7

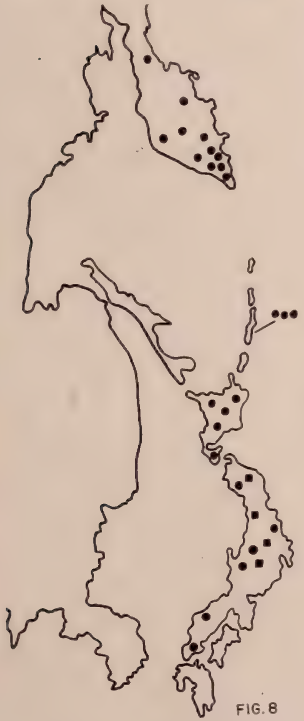


FIG. 8

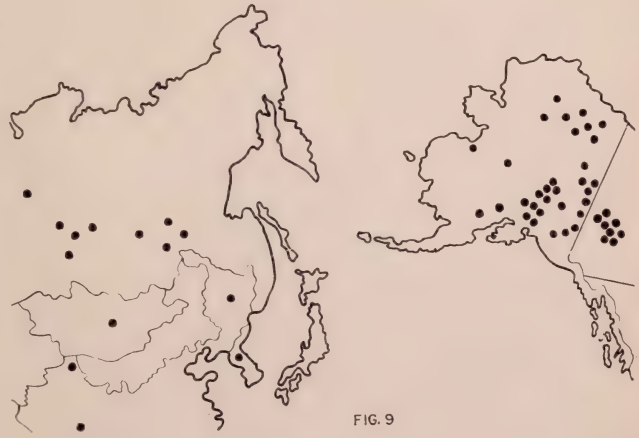


FIG. 9

FIGS. 6–9. FIG. 6. Map of Asia showing the distribution of *Luzula plumosa* var. *plumosa* (●) and *Luzula plumosa* var. *reflexa* (■). FIG. 7. Map of Japan showing the distribution of *Luzula plumosa* var. *brevipes* (●). FIG. 8. Map of Japan and northeastern Asia showing the distribution of *Luzula rostrata* var. *rostrata* (■) and *Luzula rostrata* var. *jimboi* (●). FIG. 9. Map of northeastern Asia and Alaska showing the distribution of *Luzula rufescens* (●).

Wall. The following note is written on the sheet by E. Meyer, 1844. "Luzulae nova species, *Forsteri* proxima, L. *plumosa* nomine descript." In the opinion of the author this specimen is the type of this species.

Representative Specimens: CHINA: Patung: *A. Henry 5206* (K). Szechwan: *K. L. Chu 2327* (K); *F. T. Wang 22981* (S); *H. Weigold* (May 8, 1915) (S). Yunnan: *C. W. Wang 63204* (GH). INDIA (northern): *K. Biswas 6685* (GH); *Griffith 5464* (K); *J. D. Hooker* (May, 1840) (K); *Strachey & Winterbottom 1* (GH, K, LE). NEPAL: *Staiton, Sykes & Williams 2670* (GH), *4929* (GH); *Wallich* (K—TYPE). TIBET: *King 449* (K), (May, 1885) (K).

Hybrids. No natural occurring hybrids have been reported, and none were found during this study.

6b. **Luzula plumosa** Wall. ex E. Mey. var. **reflexa** Ebinger, var. nov.

A var. *plumosa* inflorescentia composita vel decomposita; pedicellis reflexis; laminis basilaribus 6–11 mm latis differt.

This variety is similar to variety *plumosa*, but differs in that the inflorescence is sometimes decompound; the pedicels are strongly nodding to reflexed, and the blades of the basal leaves are over 6 mm wide. It can also be separated from variety *brevipes* by the wider leaves and the long hooked caruncle. Most of the specimens examined were collected in the mountainous regions of China (Fig. 6), but no information was availabl as to the altitude at which they grew.

Type. *A. Henry 6316;* collected in Hupeh Providence, China 1885–88. (GH.)

Representative Specimens: CHINA: Hupeh: *A. Henry 5315* (GH, K), *6316* (GH—TYPE, K); *E. H. Wilson 614* (K), *1655* (K). Szechwan: *F. T. Wang 20818* (GH, S). Yunnan: *J. Cavalerie 3126* (K).

Hybrids. No naturally occurring hybrids have been found, however, it is possible that this variety hybridizes with *Luzula rufescens* in northern China and Siberia. This was not possible to determine due to the lack of material.

6c. **Luzula plumosa** Wall. ex E. Mey. **brevipes** (Franchet & Savatier) Ebinger, comb. nov.

Luzula rufescens Fisch. ex E. Mey. var. *brevipes* Franchet & Savatier, Enum. Pl. Jap. 96. 1879.
Luzula japonica Buchenau, Bot. Jahr. **12**: 82. 1890.
Juncodes japonicum (Buchenau) O. Ktze. Rev. Gen. Pl. **2**: 724. 1891.
Luzula macrocarpa (Buchenau) Nakai var. *laxa* Nakai, Rep. Veg. Quelpqert 30. 1914.
Luzula plumosa Wall. ex E. Mey. var. *brachycarpa* Satake, Jour. Fac. Sci. Tokyo Bot. **4**: 194. 1933.
Luzula brachycarpa (Satake) Satake in Nakai & Hondo, Nova Fl. Jap. 24. 1938.
Luzula jimboi Miyabe & Kudo var. *integra* Satake in Nakai & Hondo, Nova Fl. Jap. 17. 1938.
Luzula plumosa Wall. ex E. Mey. var. *sphaerosperma* Satake, Jour. Fac. Sci. Tokyo Bot. **4**: 195. 1933.
Luzula formosana Ohwi, Acta Phytotax. Geobot. **1**: 79. 1932.

This variety can be distinguished from others of *Luzula plumosa* by its capsule which is longer than the perianth, and its erect to slightly curved caruncle that is shorter than the seed. In the other two varieties, in contrast, the capsule equals to slightly exceeds the perianth and the caruncle is usually strongly hooked, and equals the seed in length. Moreover, variety *brevipes* may be distinguished from variety *reflexa* by its narrower leaves, and from variety *plu-*

mosa by its spreading to reflexed pedicels. This variety is generally restricted to the islands of Japan, but is occasionally found in Korea (Fig. 7).

Type. *Savatier 3368;* collected in the mountainous province of Senano (now called Nagano), Saba, Japan. (not seen.)

Representative Specimens: JAPAN: Hokkaido: *P. Faurie 238* (K), *3764* (K); *Maximowicz* (May, 1861) (K). Honshu: *Beattie & Kurihara 10738* (GH, US); *T. Date* (May 18, 1958) (TNS); *P. Faurie 252* (K), *1014* (K); *M. Furuse* (April 25, 1954) (S), (June 5, 1955) (S, TNS); *G. Hashimoto* (Aug. 7, 1931) (TNS); *E. Iishiba* (May 9, 1926) (S); *C. Kozada 9* (TI); *I. Matsumoto* (May 5, 1955) (TNS); *M. Mizushima* (June 16, 1951) (S), (June 27, 1952) (S, TI); *G. Murata* (May 3, 1956) (S); *Y. Satake 190* (TI); *Satake & Okuyama* (May 23, 1942) (TNS), (May 24, 1942) (TNS); *K. Shiota 3378* (GH), *5533* (GH), *5685* (GH), *9629* (GH), *17203* (GH); *I. Sono* (June 1, 1907) (TNS); *M. Togasi 1035* (K, S, US); *Togasi & Koidzumi 730* (K, S, US); *T. Tsuchihashi* (June 3, 1926) (TNS). Kyushu: *K. Ichikawa 218* (US); *K. Yamashita* (June 12, 1931) (TI). KOREA: *C. T. Hyoun 1583* (SKK); *Taquet 2143* (K).

Hybrids. No naturally occurring hybrids have been reported, and none were found during this study. The only taxon that it is possible for variety *brevipes* to hybridize with is *Luzula rostrata*. Hybrids were not found, however, which is probably the result of the difference in flowering time of the two taxa. It is also possible that an ecological barrier exists, but this could not be determined with certainty. From the data that was present on the herbarium sheets it was determined that variety *brevipes* blooms during April and May, while *L. rostrata* blooms in June and July. Also, *L. rostrata* is restricted to mountainous regions while variety *brevipes* grows at low altitudes. There were, however, a few specimens of this variety that bloomed later in the season while other specimens were found growing at fairly high altitudes. Thus the opportunity for hybridization may sometimes occur.

Morphologically this species is intermediate between the European species and the Asiatic species *Luzula rostrata*. *L. plumosa* var. *plumosa* is similar to *L. forsteri* in that the pedicels are erect, the flowers are essentially the same size, and the capsules equal to slightly exceed the perianth. It can be separated readily from this European species, however, since the leaves are wider, there is no mucronate projection extending from the callose tip of the leaf, and the caruncle is much larger. In contrast, var. *reflexa* is morphologically very close to *L. pilosa*. It can be separated from this species by the wider and longer culm leaves, the slightly longer perianth and the anther length which equals to slightly exceeds the filaments. Variety *brevipes*, in contrast, is more similar to *L. rostrata* than the European species. However, it can be distinguished from *L. rostrata* by its narrower culm leaves that do not taper abruptly to the callose tip, the longer perianth segments and the strongly compound inflorescence with spreading to reflexed pedicels.

The nomenclature of *Luzula plumosa* var. *plumosa* is very simple, and only three synonyms are listed. Two of these represent transfers of the specific epithet *plumosa*, either to varietal status or to another generic name that is now considered a synonym of the genus *Luzula*. The third is a herbarium name, *Juncus plumosus*, which was listed as a synonym of *L. plumosa*. Variety *brevipes*, in contrast, has numerous synonyms which are a result of the large amount of variation found in this variety. It has been generally considered to be allied to *L. plumosa*, and in the most recent flora of Japan is referred to as *L. plumosa* var. *macrocarpa* (Buchenau) Ohwi (1953). This variety name was taken from *L. rufescens* var. *macrocarpa* Buchenau. The type of this name was examined and it is referred to *L. rufescens*. Therefore the varietal name *macrocarpa* cannot be used for this Japanese material. Oddly enough Ohwi lists *L. rufescens* var. *brevipes* as a synonym of *L. plumosa* var. *macrocarpa*. This is a much earlier name than *macrocarpa,* and according to the rule of priority should have been used for this taxon. In this study the name *brevipes* is transferred to *L. plumosa* and refers to this Japanese material. Numerous other names (varieties and species) have been used also to refer to this material. These names are a result of the large amount of variability found in the same specimen or throughout a single collection and does not show geographic or ecological differences.

Very few specimens of this species were available for study; therefore it was impossible to determine the total range of variability. However, the recognition of the varieties *reflexa* and *brevipes* seems justified. Their different geographic ranges indicate that they are distinct, as do their different morphological characteristics. However, it may be more realistic to treat this complex as two or more species if future evidence, based on cytology and breeding experiments, suggest it.

7. **Luzula rostrata** Buchenau

Perennial; strongly stoloniferous to rarely slightly caespitose; stolons to 10 cm long, less than 1 mm wide, with dark colored scale-like leaves and slender adventitious roots; blades of basal leaves flat, 4–7 mm wide, to 10 (rarely 13) cm long, margins pubescent, apex callose-tipped; culms erect, 15–25 (rarely 30) cm tall, slender, smooth, bearing 2–3 leaves; sheath closed, pubescent at the throat with long white hairs; blades linear, 3–6 mm wide, to 4 (rarely 5) cm long, tapering abruptly to a callose-tip; margins sparsely pubescent, not curled; inflorescence terminal, usually compound with a few secondary pedicels; pedicels erect to slightly nodding, rarely reflexed; basal bract erect, much shorter than the inflorescence, leaf-like, green, the margins sparsely pubescent, callose-tipped; other bracts light brown or purple, short; inner bract at the base of the pedicels usually truncate with a hyaline tip, usually glabrous; outer bract at the base of each pedicel equalling to much shorter than the inner, acuminate, margins pubescent; bracteoles ovate-lanceolate, acuminate, hyaline to light brown or purple with a wide hyaline margin and tip, one third to half as long as the flower; perianth segments similar, equal, lanceolate, entire, not awned, light brown to purple, margins usually hyaline, 2–3.5 mm long; stamens 6 shorter than the perianth, filaments linear white 0.6–1.0 mm long, anthers linear to ovate, vary in length from shorter to longer than the filaments; pistil erect, ovary three angled to round, style filiform 0.5–1 mm long, stigmas 3 erect 1.3–2 mm long, extending above the perianth; fruit longer than the perianth, to 4 mm long, apex mucronate with the persistent base of the style, usually stramineous to light brown; seeds 1.2 mm long, dark purple to castaneous; caruncle situated on apex and side of the seed, almost as wide as the seed, to as long as the seed, erect to slightly curved.

Key to the Varieties

1. Sepals 2–2.5 mm long, purple with the hyaline margins very narrow or lacking; anthers ovate, shorter than the filaments; caruncle erect, usually shorter than the seed. var. *rostrata.*
1. Sepals over 2.5 mm long, light brown to light purple with a wide hyaline margin; anthers linear, usually equal to or longer than the filaments; caruncle curved, usually as long as the seed. var. *jimboi.*

7a. **Luzula rostrata** Buchenau var. **rostrata**

Luzula rostrata Buchenau, Das Pflanzenreich 25(4): 47. 1906.

This variety is distributed in the higher mountainous regions of Japan (Fig. 8). It can easily be distinguished from variety *jimboi* by the smaller flowers that are dark purple, and by the smaller ovate anthers and the straight caruncle.

Type. *Faurie 2700,* collected in Matsumura, Japan. (not seen.)

Representative Specimens: JAPAN: Honshu: *A. Kitazawa* (June 20, 1958) (TNS); *M. Matsuda* (July 26, 1957) (TNS); *S. Okuyama* (July 20, 1936) (TNS); *K. Shiota 3379* (GH); *S. Sugaye* (Aug. 19, 1952) (TNS).

Hybrids. No naturally occurring hybrids have been reported and none were found during this study. Although this variety occurs in Japan the possibility that it hybridizes with *Luzula plumosa* var. *brevipes* from this region seems remote. This results from two peculiarities of this species; first, it blooms much later in the year than does *L. plumosa* var. *brevipes,* and second, it is restricted to the mountainous regions of Japan while var. *brevipes* is usually found at lower altitudes.

7b. **Luzula rostrata** Buchenau var. **jimboi** (Miyabe & Kudo) Ebinger, comb. nov.

Luzula jimboi Miyabe & Kudo, Trans. Sapp. Nat. Hist. Soc. 5: 37. 1913.
Luzula elata Satake, Jour. Jap. Bot. 14: 260. 1938.

This variety is generally restricted to northern Japan, the Kuril Islands, and the Kamchatka Peninsula (Fig. 8). It is easily distinguished from the more southern variety by the larger flowers that are not purple, the anthers that usually equal or exceed the filaments in length, and the curved caruncle that is usually as long as the seed.

Type. *K. Jimbo.* June 13, 1891, collected on the Kurile Islands, Etorofu. (Not seen.)

Representative Specimens: JAPAN: Honshu: *K. Kimura* (July 30, 1928) (TI), (July 15, 1929) (TI); *Y. Momiyama* (July 4, 1931) (TI); *S. Okuyama* (July 21, 1934) (TNS); *Y. Yamazaki* (Aug. 5, 1954) (TI). Hokkaido: *S. Okuyama* (July 18, 1941) (TNS); *Satake* (July 28, 1931) (TI); *K. Uno 2596* (GH); *I. Yamamoto 4322* (TI). KURIL ISLANDS: *S. Bergman 122* (S), *176* (S), *362* (S). RUSSIA: (Kamchatka Pen.): *W. Eyerdam* (June 27, 1928) (S), (July 10, 1928) (S); *E. Hulten 191* (GH), *2183* (S), *3816* (S); *V. L. Komarov* (June 18, 1908) (S), (June 22, 1908) (K), (June 23, 1909) (K).

Hybrids. No naturally occurring hybrids have been reported and none were found during this study.

This species is easily distinguished from the other Asiatic ones by the cauline leaves that taper abruptly to a callose-tip. The erect pedicels of the inflorescence and the large curved caruncle also serve to separate it from *Luzula plumosa* var. *brevipes* and *L. rufescens.* Although this species does come into contact with *L. plumosa* in Japan it is unlikely that they hibridize. This lack of hybridization is probably a result of differences in blooming period and habitat. *L. plumosa* var. *brevipes* blooms in April and May and generally grows at low altitudes. In contrast, *L. rostrata* flowers in late June, July and August and the specimens from Japan appear to grow at much higher elevations. These two conditions indicate that hybridization between these two species, rarely, if ever takes place in nature.

Although no breeding experiments are available with this species, its relationships can be inferred by its morphology. The similarities of this species to *Luzula rufescens* are striking. Both typically have stolons, inflorescences that are not strongly compound, and fairly small flowers.

8. **Luzula rufescens** Fisch. ex E. Mey.

Luzula rufescens Fisch. ex E. Mey. Linnaea 22: 385. 1849.
Juncodes rufescens (Fisch. ex E. Mey.) O. Ktze. Rev. Gen. Pl. 2: 725. 1891.
Luzula rufescens Fisch. ex E. Mey. var. *macrocarpa* Buchenau, Das Pflanzenreich 25(4): 47. 1906.
Luzula macrocarpa (Buchenau) Nakai, Rep. Veg. Quelpaert 30. 1914.
Luzula plumosa Wall. ex E. Mey. var. *macrocarpa* (Buchenau) Ohwi, Fl. Japan 271. 1953.

Perennial, short stolons to caespitose, stolons to 4 cm long, less than 1 mm wide, having dark brown scale-like leaves and slender adventitious roots; basal leaves with flat blades, 1–3 mm wide, to 6 (rarely 10) cm long, margins sparsely pubescent, apex callose-tipped; culms erect, slender, smooth, 10–20 (rarely 30) cm tall, bearing 2–3 leaves; sheaths closed, lightly pubescent at the throat with white hairs; blades linear, flat, 1–2.5 mm wide to 4 (rarely 6) cm long, tapering gradually to the tip, margins glabrous to sparsely pubescent, usually curled toward the apex, callose-tipped; inflorescence terminal, simple, rarely a few secondary pedicels are present; pedicels spreading to slightly nodding, never reflexed; basal bract erect, much shorter than the inflorescence, leaf-like, green, margins glabrous to slightly pubescent, callose-tipped; other bracts brown with hyaline margins, short, the inner bract at the base of each pedicel, brown, truncate with a hyaline tip, usually glabrous; outer bract usually shorter than the inner, tip acuminate, usually glabrous; bracteoles at the base of the flower ovate, hyaline to light brown, half as long as the flower; perianth segments similar, equal, lanceolate, entire, light or dark brown with hyaline margins, 1.6–2.5 mm long; stamens 6 shorter than the perianth, filaments linear, the same length as the anthers, anthers linear; pistil erect, ovary acute at the tip, 3 angled, style filiform less than 0.7 mm long, stigmas 3 erect to spreading 1.5 mm long equalling to slightly longer than the perianth; fruits equalling to exceeding the perianth, to 3.5 mm long, tip acute to subtruncate with a short mucronate tip from the persistent base of the style, stramineous to light brown, sometimes flecked with purple; seeds 1.4 mm long, dark brown to black; caruncle erect to slightly curved, narrow, to 0.6 (rarely 1.0) mm long.

Type. Turczaninow, in Siberia near Irectia. A specimen in the herbarium of the Department of Systematics and Plant Geography, Botanical Institute, Academy of Science, USSR. (LE) is labeled *Luzula rufescens,* and was originally from the Fischer Herbarium. This specimen was collected by Turczaninow in Irectia in 1828 and probably represents the type of this species.

Representative Specimens: ALASKA: *J. P. Anderson 245* (ALA), *2432* (S), *3497* (S), *8802* (S), *9155* (S); *Anderson & Brown 10213* (S); *Anderson & Gasser 7206* (S); *G. W. Argus 307* (ALA), *390* (ALA); *J. W. Bee 520721–13* (US); *Cody & Webster 5212* (S); *F. Funston 47* (GH, S, US), *116* (US); *A. R. Hodgdon 8316* (S), *8322* (US), *8455* (S), *8584* (S), *8856* (S); *L. H. Jordal 2450* (S, US), *3694* (US); *A. & R. A. Nelson 3525* (ALA, GH); *L. J. Palmer 245* (US); *A. E. & R. T. Porsild 22* (GH, S, US), *126* (GH, S, US), *218* (S); *E. Scamman 1707* (GH), *1823* (GH), *1951* (GH, US), *2032* (GH), *5689* (GH), *6482* (GH); *G. Smith 1788* (ALA); *Smith & Viereck 2349* (ALA, S); *L. A. Viereck 1565* (S), *3242* (ALA); *C. W. Weidman 5* (US). CANADA: (Yukon): *Calder & Billard 3177* (US), *4414* (S); *A. Eastwood 152* (GH); *J. M. Macoun* (Sept. 1, 1891) (US), (July 12, 1902) (US), (July 28, 1902) (S, US); *R. S. Williams* (June 14, 1899) (US), (July 16, 1899) (US), (July

23, 1899) (US). CHINA: Shansi: *A. Lerre 523* (S). Szechwan: *H. Smith 2093* (S). KOREA: *V. Komarov 355* (K). MANCHURIA: *K. Yamatsuta* (June 29, 1931) (TNS). MONGOLIA: *N. Pavlov 74* (S). RUSSIA: Amur: *W. Docturowsky 1215* (S); *F. Karo 361* (K); *Maximowicz* (May 17, 1855) (LE). Irkutsk: *H. Nilsson-Ehle* (June 4, 1898). Krasnoyarsk: *H. W. Arnell* (July 18, 1876) (S); *M. Brenner* (July 7, 1876) (S).

Hybrids. No naturally occurring hybrids have been reported. Moreover, in the material examined no intermediate plants were found between this species and *Luzula rostrata* var. *jimboi* in northeastern Siberia. The similarity of these two species, however, indicates that hybrids would probably occur if the two species come into contact. Also, it is very probable that *L. rufescens* hybridizes with *L. plumosa* in southeastern Siberia. Unfortunately there is very little herbarium material from this region, so no conclusive results could be obtained.

Luzula rufescens is easily distinguished from the other members of the subgenus by the smaller flowers, narrower leaves, and usually simple corymbose inflorescence with erect to spreading pedicels. However, occasionally it has been confused with *L. plumosa* var. *brevipes* and *L. rostrata*. The relationship of this species to others of the subgenus is still undetermined because, in the experiments of Nordenskiöld (1957) the F_1 hybrids were usually sterile. However, the small flowers, stoloniferous habit and slightly curved caruncle indicate a relationship to *L. rostrata*.

The nomenclature of this species is very simple. One variety (*macrocarpa*) has been described, but present information indicates that this is just natural variation within the species. This varietal name has also been raised to specific rank [*L. macrocarpa* (Buchenau) Nakai], and moreover has been considered a variety of another species (*L. plumosa* var. *macrocarpa*). This latter transfer was used for the Japanese species of *L. plumosa*. The type specimen of this name was examined, and in the author's opinion it is referable to *L. rufescens* rather than *L. plumosa*.

This species is found on two continents. In Asia it occurs from the tundra region of eastern Siberia, south into the mountains of Mongolia and northern China, while in North America it is found in Alaska and the western part of the Yukon District of Canada (Fig. 9). Throughout this range it is polymorphic. Most of the specimens from northeastern Siberia are less than 20 cm tall and the mature capsule equals to slightly exceeds the perianth, while the southern specimens are usually taller (to 30 cm) and the capsule exceeds the perianth. These taller plants have generally been referred to as variety *macrocarpa*. In contrast, the plants from North America range in size from 20–30 cm tall, the mature capsule exceeds the perianth and is flecked with purple. Varieties could not be distinguished, however, because of the high variability of the traits mentioned above.

Literature Cited

Anderson, E. 1949. Introgressive hybridization. i–ix. 1–109. New York, John Wiley & Son.

Babington, C. C. 1851. Manual of British botany, containing the flowering plants and ferns arranged according to the natural orders. ed. 3. i–xxxii. 1–434. London, John Van Voorst.

Brügger, C. G. 1880. Wildwachsende pflanzenbastarde in der Schweiz und deren nachbarschaft. Jahresb. Naturf. Ges. Graubundens NF. **23/24**: 47–123.

Buchenau, F. 1890. Monographia Juncacearum. Bot. Jahrb. **12**: 1–495.

——. 1906. Juncaceae, in Das Pflanzenreich **25**(4): 1–284.

Desvaux, N. A. 1808. Mémoire sur une monographie du genre *Luzula*. Jour. Bot. Desvaux **1**: 129–165.

Domin, K. 1935. Plantarum Cechoslovakiae Enumeratio species vasculares indigenas et introductas exhibens. Preslia **13/15**: (*Luzula* pp. 23–24).

Ebinger, J. 1962a. *Luzula* × *borreri* in England. Watsonia **5**: 251–254.

——. 1962b. The varieties of *Luzula acuminata*. Rhodora **64**: 74–83.

Ehrhart, F. 1787–1792. Beitrage zur Naturkunde und den damit verwandten Wissenschaften. 7 v. Hannover & Osnabruck, Schmidt. (*Juncus* **6**: 137–142. 1791).

Fassett, N. C. 1957. Spring flora of Wisconsin. A manual of plants growing without cultivation and flowering before June 15. ed. 3. i–x. 1–189. Madison, Univ. Wisconsin Press.

Fernald, M. L. 1950. Gray's Manual of Botany. ed. 8. i–lxvi. 1–1632. New York, American Book Co.

Fournier, P. 1935. Les quatre flores de France. (*Luzula* pp. 152–154). Nancy.

Fourreau, M. 1869. Catalogue des plantes du Cours du Rhône. Ann. Soc. Linn. Lyon, NS. **17**: (Juncaceae pp. 171–173).

Gleason, H. A. 1952. The New Britton and Brown illustrated flora of the northeastern United States and adjacent Canada. 3 v. Lancaster, Lancaster Press. (*Luzula* **1**: 400–402).

Grisebach, A. 1843–1845. Spicilegium Florae rumelicae et bithnicae, exhibens synopsin plantarum quas aest. 1839 legit. 2 v. Brunsvige. (*Luzula* **2**: 404–405. 1844).

Hermann, F. J. 1946. A checklist of plants in the Washington-Baltimore Area. ed. 2. 1–134. Conference on District Flora. (mimeographed.)

Jones, G. N. 1950. Flora of Illinois. ed. 2. i–vi. 1–368. Notre Dame, Univ. of Notre Dame Press.

Kuntze, O. 1891–1898. Revisio generum plantarum. 3 v. Leipzig, Arthur Felix. (*Juncodes* **2**: 722–725. 1891).

Lamarck, J. B. de & DeCandolle, A. P. 1805. Flora Francaise, ou descriptions succinetes de toutes les plantes qui croissent naturellement en France. ed. 3. 4 v. Paris. (*Luzula* **3**: 158–162).

Lanjouw, J. & Stafleu, F. A. 1959. Index Herbariorum. Pt. 1. The Herbaria of the World. ed. 4. Regnum Vegetabile 15. 1–249.

Linnaeus, C. 1753. Species Plantarum. ed. 1. 2 v. Stockholm. (*Juncus* **1**: 325–330).

Malheiros, Nydia & de Castro, D. 1947. Chromosome number and behavior in *Luzula purpurea* Link. Nature **160**: 156.

Murr, J. 1930. Luzulae hybridae novae. Magyar Bot. Lapok **28**: 67–68.

Nordenskiöld, Hedda. 1951. Cyto-taxonomical studies in the genus *Luzula*. I. Somatic chromosomes and chromosome numbers. Hereditas **37**: 325–355.

——. 1957. Hybridization experiments in the genus *Luzula*. III. The subgenus *Pterodes*. Bot. Not. **110**: 1–16.

Ohwi, J. 1953. Flora of Japan. i–v. 1–1383. Tokyo, Shibundo Co.

Reichard, J. J. 1772–1778. Flora Moeno-Francofurtana, enumerans stirpes circa Francofurtum ad Moenum crescentes, secundum methodum sexualem dispositas. 2 v. Francofurti, M. L. Brönner. (*Juncus* **2**: 181–182. 1778).

Schrader, F. 1931. The chromosome cycle of *Protortonia primitiva* (Coccidae) and a consideration of the meiotic division apparatus in the male. Zeitschr. Wiss. Zool. **138**: 386–408.

Strausbaugh, P. D. & Core, E. L. 1952. Flora of West Virginia. Part I. West Virginia Univ. Bull. Series 52. No. 12–2. (*Luzula* pp. 220–221).

Syme, J. B. 1872. Report of the Botanical Exchange Club for the year 1872. Jour. Bot. British & Foreign **10**: 237–247.

Villars, D. 1786–1789. Histoire des plantes de Dauphine. 3 v. Grenoble, publ. by author. (*Juncus* **2**: 229–243. 1787).

FEB 1964 MEMOIRS OF THE NEW YORK BOTANICAL GARDEN **10**(5):305–326

LISTS AND KEYS OF THE CEDAR RUSTS OF THE WORLD[1]

Frank D. Kern

Emeritus Professor of Botany, The Pennsylvania State University

These lists and keys have been prepared in connection with a monographic study of the cedar rusts (genus *Gymnosporangium*) of the world. It is the author's belief that such a presentation will be found to have value in the hands of other workers.

Gymnosporangium was described by Hedwig. f. in de Candolle (Lamarck & Candolle; Flore Francais 3rd Ed. tome 2, pp. 216 and 217). One species is autoecious (*G. bermudianum*) on *Juniperus,* two species have uredial stages (*G. nootkatense* in the United States and *G. gaeumanni* in Switzerland). With these exceptions the species are heteroecious and demicyclic. Most of the species where the life cycles are known have their aecial stages (form-genus *Roestelia*) on the members of the Rosaceae tribe Pomeae or family Malaceae (depending upon the classification used). Exceptions are *G. ellisii* on the bayberry family, *G. speciosum* on the saxifrage family, and *G. exterum* and *G. vauqueliniae* on the rose family. A few are known only in the telial stage and several are known only in the aecial (roestelial) stage.

The species possess such variable characters that a generic description is difficult.

The aecia are chiefly roestelioid, i.e., with elongated peridia, cylindrical or cornute, dehiscent by apical or lateral rupture; the aeciospore wall is usually colored, with numerous scattered pores. The telia may be variously shaped, applanate or pulvinate, laterally compressed or wedge-shaped, or terete, sometimes irregular, and usually expand when moistened due to the gelatinization of the long pedicels. In most species there can be distinguished darker, thick-walled teliospores and lighter, thin-walled teliospores.

It is believed that the lists and keys are self-explanatory. The drawings and photographs are included not so much to present the characters of certain species but rather to illustrate the meaning of some of the descriptive terms. It seems needless to point out that this sort of effort has its limitations, however. It must be acknowledged that the keys are not strictly dichotomous and that final separations may be difficult or confusing. In any event a contribution is being offered toward the identities, relations, and ranges of the various species.

In the check lists citations are included for the 55 valid species in *Gymnosporangium,* and the 11 names of the form species known in the aecial stage only. A bibliography of publications on the genus *Gymnosporangium* is very long. These selected references are presented as an aid to those interested in the taxonomy of the genus:

---

[1] Contribution No. 288 of the Department of Botany and Plant Pathology, The Pennsylvania State University.

Arthur, J. C. 1934. Manual of the rusts in United States and Canada. 1–438.

Bernaux, Paul. 1956. Contribution a l'étude de la biologie des *Gymnosporangium*. Ann. Epiphyt. 7: 1–210.

Crowell, Ivan H. 1940. The geographical distribution of the genus *Gymnosporangium*. Canad. Jour. Res. C. **18**: 469–488.

Cummins, G. B. & Ling, L. 1950. An index of the plant rusts recorded for continental China and Manchuria. Pl. Dis. Reporter Suppl. **196**: 520–556.

Cummins, G. B. & Stevenson, J. A. 1956. A check list of North American rust fungi (Uredinales). Pl. Dis. Reporter Suppl. **240**: 109–193.

Eriksson, J. 1918. Die Schwedischen Gymnosporangien ihr Wirtswechsel und ihre Spezialisierung. K. Svens. Vet-Acad. Handl. **59**: 1–82.

Fischer, Ed. 1891. Ueber *Gymnosporangium sabinae* (Dicks.) und *Gymnosporangium confusum* Plowright. Zeitschr. Pflanzenkr. **1**: 193–208, 260–283.

——. 1895. Die Zugehörigkeit von *Aecidium penicillatum*. Hedwigia **34**: 1–6.

Grasso, V. 1956. I *Gymnosporangium* di alcuni boschi della Toscana e le loro forme picnoecidiche. Ann. Accad. Ital. Sci. Foresta **5**: 21–89.

Hiratsuka, N. 1936, 1937. *Gymnosporangium* of Japan. I. Bot. Mag. Tokyo **50**: 481–488. II. 549–555. III. 593–599. IV. 661–668. V. **51**: 1–8.

Jørstad, I. 1942. Some cyprian Uredinales. Nytt Mag. Naturvid. B. **83**: 191–229.

Hylander, N., Jørstad, I. & Nannfeldt, J. A. 1953. Enumeratio uredinearum Scandinavicarum. Opera Bot. **1**: 1–102.

Kern, Frank D. 1910. The morphology of the peridial cells in the Roesteliae. Bot. Gaz. **49**: 445–452.

——. 1911. A biologic and taxonomic study of the genus *Gymnosporangium*. Bull. N. Y. Bot. Gard. **7**: 391–483.

——. 1960 [1962]. Changing concepts in the genus *Gymnosporangium*. Mycologia **52**: 837–844.

Prince, Alton E. 1946. The biology of *Gymnosporangium nidus-avis* Thaxter. Farlowia **2**: 475–525.

Tanaka, T. 1922. New Japanese fungi. Notes and translations—XII. Mycologia **14**: 282–295.

CHECK LIST OF THE SPECIES OF GYMNOSPORANGIUM

(* The twelve species preceded by an asterisk known in telial stage only.)

amelanchieris Ed. Fisch. ex Kern. Bull. N. Y. Bot. Gard. **7**: 443. 1911.
asiaticum Miyabe ex Yamada. Shokubutsu Byorigaku (Plant Pathology) Tokyo Hakubunkwan, M. 37, **9**: 304–306. 1904.
atlanticum* Guyot & Malencon. Trav. Inst. Scient. Cherifien Ser. Bot. **11: 15. 1957.
bermudianum Earle in Seymour & Earle. Economic Fungi No. *249*. 1893.
betheli Kern. Bull. Torrey Club **34**: 459. 1907.
biseptatum Ell. Bull. Torrey Club **5**: 46. 1874.
clavariiforme (Pers.) DC. Fl. Fr. **2**: 217. 1805.
clavipes (Cke. & Pk.) Cke. & Pk. in Pk. Ann. Rep. N. Y. St. Mus. **25**: 89. 1873.
confusum Plowr. Brit. Ured. and Ustil. p. 232. 1889.
corniculans Kern in Arth. Mycologia **2**: 236. 1910.
corniforme* Sawada ex Hiratsuka f. Bot. Mag. Tokyo **50: 554. 1936.
cornutum Arth. ex Kern. Bull. N. Y. Bot. Gard. **7**: 444. 1911.
cunninghamianum Barcl. Sci. Mem. Med. Off. India **5**: 78. 1890.
cupressi Long & Goodding in Long. Bot. Gaz. **72**: 39. 1921.
davisii Kern. Bull. Torrey Club **35**: 507. 1908.
effusum* Kern. Bull. N. Y. Bot. Gard. **7: 459. 1911.
ellisii (Berk.) Ell. N. Am. Fungi No. *271*. 1877.
exiguum Kern. Bull. Torrey Club **35**: 508. 1908.
exterum Arth. & Kern in Arth. Mycologia **1**: 254. 1909.
floriforme Thaxt. in Kern. Bull. Torrey Club **35**: 503. 1908.

formosanum* Hiratsuka f. & Hashioka. Bot. Mag. Tokyo **49: 21. 1935.
fraternum Kern. Bull. N. Y. Bot. Gard. **7**: 439. 1911.
fuscum DC. Fl. Fr. **2**: 217. 1805.
fusisporum Ed. Fisch. Mitt. Naturforsch. Ges. Bern **1917**: 73. 1918.
gaeumanni* H. Zogg. Ber. Schweiz. Bot. Ges. **59: 426. 1949.
globosum Farl. The Gymnosporangia or Cedar Apples of the U. S. p. 34. 1880.
gracile Pat. Bull. Soc. Mycol. Fr. **18**: 46. 1902.
harknessianum Kern ex Arth. N. Am. Flora **7**: 737. 1926.
hemisphericum K. Hara. Dainippon Sanrin Kwaiho (Jour. Forest. Soc. Japan) **419**: 16–18. 1917.
hyalinum Kern ex Cummins. Mycologia **48**: 603. 1956.
inconspicuum Kern. Bull. Torrey Club **34**: 461. 1907.
japonicum Sydow. Hedwigia Beibl. **38**: 141. 1899.
juniperi-virginianae Schw. Shr. Nat. Ges. Leipzig **1**: 74. 1822.
kernianum Bethel. Mycologia **3**: 157. 1911.
libocedri (P. Henn.) Kern. Bull. Torrey Club **35**: 509. 1908.
meridissimum* Crowell. Canad. Jour. Res. C. **18: 11–12. 1940.
minus* Crowell. Canad. Jour. Res. C. **18: 10. 1940.
miyabei Yamada & Miyake. Shok. Zass. (Bot. Mag.) Tokyo **22**: 23. 1908.
multiporum* Kern. Mycologia **1: 210. 1909.
nelsoni Arth. Bull. Torrey Club **28**: 665. 1901.
nidus-avis Thaxt. Conn. Agr. Exp. Sta. Bull. **107**: 3. 1891.
nipponicum Yamada in Hiratsuka f. Mem. Tottori Agr. Coll. **3**: 143. 1935.
nootkatense Arth. Am. Jour. Bot. **3**: 44. 1916.
padmarense* Balfour-Brown. Bull. Brit. Mus. (Nat. Hist.) Bot. **1: 205. 1955.
paraphysatum* Viennot-Bourgin. Revue de Mycol. **25: 304. 1960.
shiraianum K. Hara. Byochu-gai Zasshi (Jour. Pl. Prot.) **62**: 684. 1919.
speciosum Pk. Bot. Gaz. **4**: 217. 1879.
**taianum* sp. nov. (see below).
torminali-juniperinum Ed. Fisch. Zeitschr. Bot. **2**: 759. 1910.
trachysorum Kern in Arth. Mycologia **2**: 237–238. 1910.
tremelloides Hartig. Lehrb. Kaumkrankh. p. 55. 1882.
tsingchensis* Wei. Bot. Bull. Acad. Sinica **1: 210. 1947.
turkestanicum Tranz. Consp. Ured. U. S. S. R. p. 77. 1939.
vauqueliniae Long & Goodding. Mycologia **31**: 671. 1939.
yamadae Miyabe ex Yamada in Omori. G. Shokubutzu Byorigaku (Plant Pathology) Tokyo Hakubunkwan, M. 37, p. 306–308. 1904.

Gymnosporangium taianum Kern, sp. nov.

Teliis caulicoli, in ramulis viridibus ligneisque evolutis, matrice leviter tumescenti, ordinatis in ligneis, solitariis in viridibus; hemisphaericis, 1.5–3 mm diam., vel oblongis et linguiformibus, 2–3 mm altis, fusco-brunneis (''carob brown''); teliosporis medio 1-septatis, ellipsoideis vel oblongo-ellipsoideis, 24–30 × 53–67 μ, episporio 2–3 μ, cinnamomeo-brunneo, vel late ellipsoideis, 29–36 × 57–63 μ, episporio 3–4 μ, castaneo-brunneo; poris 4–6 vel pluribus in quaque cellula, in uno zono transverso prope a septo, aut in duobus zonis, ad apicem et ad basim uno vel duobus tantum; pedicello elongato.

Type. On *Cupressus duclouxiana*, Yunnan, Kunming, China, *F. L. Tai et al. 8097* (Herbarium, Plant Pathology, National Tsing Hua University, Kunming).

Tai (Farlowia **3**: 107. 1947) described this species in English. He knew that it did not agree with *Gymnosporangium cunninghamianum* but nevertheless referred it to that species. It is herein described as a new species. Tai cites three numbers, *8097, 8162, 8197*. I designate *8097* as the type. Tai illustrated two teliospores (Farlowia **3**: 137, fig. 8, 1947).

KNOWN IN AECIAL STAGE ONLY

distortum (*Gymnosporangium*) Arth. & Cumm. Mycologia **25**: 400. 1933.
fenzelianum (*Gymnosporangium*) Tai & Cheo, Bull. Chinese Bot. Soc. **3**: 60. 1937.
guatemalianum (*Gymnosporangium*) Crowell, Canad. Jour. Res. C. **18**: 11. 1940.
leve (*Gymnosporangium*) Crowell, Jour. Arnold Arb. **17**: 50. 1936.
magnum (*Gymnosporangium*) Crowell, Jour. Arnold Arb. **17**: 50. 1936.
malyi (*Gymnosporangium*) Picbauer, Glasnika Zemaljskeg. Muz. Bozni Hercegorini **41**: 32. 1929.
nanwutianum (*Gymnosporangium*) Tai & Cheo, Bull. Chinese Bot. Soc. **3**: 60. 1937.
patulum (*Aecidium*) Sydow, Ann. Mycol. **5**: 506. 1907.
pourthiaeae (*Aecidium*) Sydow, Mem. Herb. Boiss. **4**: 3. 1900.
sikangense (*Gymnosporangium*) Petrak, Acta Horti Gothob. **17**: 120. 1947.
wenshanense (*Gymnosporangium*) Tai, Farlowia **3**: 108. 1947.

DISPOSITION OF NON-VALID NAMES IN THE GENUS GYMNOSPORANGIUM

(A partial list only)

Synonyms	*Accepted names*
aurantiacum Chev.	*cornutum*
aurantiacum Sydow	*libocedri*
blasdaleanum Kern	*libocedri*
botryapites Kern	*biseptatum*
chinense Long.	*asiaticum*
durum Kern	*nelsoni*
germinale Kern	*clavipes*
gracilens Kern & Bethel	*speciosum*
haraeanum Sydow	*asiaticum*
idetae Yamada	*amelanchieris*
juniperi Link	*cornutum*
juniperinum Mart.	*tremelloides*
juvenescens Kern	*nidus-avis*
koreanse Jacks.	*asiaticum*
macropus Link	*juniperi-virginianae*
mespili Kern	*confusum*
myricatum Fromme	*ellisii*
orientale Sydow	*clavariiforme*
oxycedri Bres.	*confusum*
penicillatum Liro	*tremelloides*
photiniae Kern	*japonicum*
sabinae Wint.	*fuscum*
solenoides Kern	*miyabei*

Synonyms	*Accepted names*
sorbi Kern	*nootkatense*
spiniferum Sydow	*asiaticum*
tauricum Erikss.	*confusum*
transformans Kern	*fraternum*
tubulatum Kern	*betheli*
yamadai Miyabe	*yamadae*

GEOGRAPHICAL DISTRIBUTION BY CONTINENTS

NORTH AMERICA

asiaticum (introduced)
bermudianum
betheli
biseptatum
clavariiforme
clavipes
corniculans
cornutum
cupressi
davisii
effusum
ellisii
exiguum
exterum
floriforme
fraternum
fuscum (introduced)
globosum
gracile
harknessianum
hyalinum
inconspicuum
japonicum (introduced)
juniperi-virginianae
kernianum
libocedri
meridissimum
multiporum
nelsoni
nidus-avis
nootkatense
speciosum
tremelloides
trachysorum
vauqueliniae

Known in aecial stage only
guatemalianum

EUROPE

amelanchieris
clavariiforme
confusum
cornutum
fuscum
fusisporum
gaeumanni
gracile
minus
torminali-juniperinum
tremelloides

Known in aecial stage only
malyi

ASIA

amelanchieris
asiaticum
clavariiforme
confusum
corniforme
cornutum
cunninghamianum
formosanum
fuscum
hemisphericum
japonicum
miyabei
nipponicum
padmarense
paraphysatum

ASIA (continued)

shiraianum
taianum
tsingchensis
turkestanicum
yamadae

Known in aecial stage only
distortum

fenzelianum
leve
magnum
nanwutianum
patulum
pourthiaeae
sikangense
wenshanense

AFRICA

atlanticum
clavariiforme
confusum

cornutum ?
fuscum
gracile

ANALYTIC KEYS

Aecial Stage Exclusively Considered

1. Aecia cupulate, peridium short, lacerate or erose.	
2. Aeciospore-wall thicker above.	(*Aecidium*) *patulum.*
2. Aeciospore-wall evenly thick.	
3. Aeciospore-wall pale brown.	*magnum.*
3. Aeciospore-wall pale yellow.	
4. Wall thin (1–1.5 μ).	*libocedri.*
4. Wall thick (3–4 μ).	*nootkatense.*
3. Aeciospore-wall nearly colorless.	
5. Wall thin (1 μ).	(*Aecidium*) *pourthiaeae.*
5. Wall medium thick (2–3 μ).	
6. Wall strongly verrucose.	*ellisii.*
6. Wall minutely verrucose.	*wenshanense.*
1. Aecia roestelioid.	
7. Peridium retaining tubular or cornute form, not much altered by dehiscence.	
8. Peridium finally dehiscent at apex, slightly or not lacerate.	
9. Peridial cells verrucose.	
10. Side-walls of peridial cells verrucose only on inner third.	
11. Aeciospore-wall pale yellow, 2–2.5 μ.	*inconspicuum.*
11. Aeciospore-wall cinnamon-brown, 1–1.5 μ.	*miyabei.*
10. Side-walls of peridial cells verrucose over entire surface.	
12. Aeciospore-wall finely verrucose, 2–2.5 μ.	*harknessianum.*
12. Aeciospore-wall rugose-verrucose, 2.5–3 μ.	*malyi.*
9. Peridial cells verruculose.	
13. Aeciospores 20–26 × 23–31 μ, wall 2–3 μ.	*nipponicum.*
13. Aeciospores 18–23 × 19–28 μ, wall 1.5–2 μ.	*asiaticum.*
9. Peridial cells closely papillose.	*vauqueliniae.*
9. Peridial cells subspinulose.	*japonicum.*
9. Peridial cells spinulose.	
14. Peridial cells rather long (80–120 μ).	
15. Aeciospore-wall verruculose.	*guatemalianum.*
15. Aeciospore-wall smooth.	*leve.*
14. Peridial cells not so long (50–90 μ).	
16. Peridium hypophyllous, 1–3 mm high.	*nanwutianum.*
16. Peridium hypophyllous and fructicolous, 2–6 mm.	*exiguum.*
9. Peridial cells semi-rugose, with elongated papillae.	*nelsoni.*
9. Peridial cells rugose.	
17. Inner and side walls rather sparsely or coarsely rugose.	
18. Inner and side walls 7–9 μ thick, aeciospore-wall 1.5–2 μ.	*amelanchieris.*

18. Inner and side walls 2–2.5 μ thick, aeciospore-wall 2–2.5 μ. *cornutum.*
17. Inner and side walls densely and rather finely rugose.
19. Aeciospore-wall dark cinnamon-brown, aeciospores 18–25 × 20–29 μ. *hemisphericum.*
19. Aeciospore-wall yellowish brown, aeciospores 18–23 × 23–38 μ. *fenzelianum.*
8. Peridium tardily or not at all dehiscent at apex, with slits along the sides.
20. Peridial cells tuberculate.
21. Papillae on side-walls short, aeciospore-wall 1.5–2.5 μ. *yamadae.*
21. Papillae on side-walls blunt, aeciospore-wall 2.5–3.5 μ. *kernianum.*
20. Peridial cells verrucose with roundish or oval papillae. *corniculans.*
20. Peridial cells verrucose-rugose with irregular papillae. *cupressi.*
20. Peridial cells rugose with closely set ridge-like papillae. *davisii.*
20. Peridial cells smooth. *biseptatum.*
7. Peridium more or less tubular, altered by becoming lacerate or fimbriate.
22. Peridium strongly revolute.
23. Peridial cells somewhat curved when wet, side-walls rugose nearly to outer side. *floriforme.*
23. Peridial cells strongly curved when wet, side-walls sparsely rugose on inner half. *juniperi-virginianae.*
22. Peridium spreading or more or less erect after dehiscence.
24. Peridial cells smooth. *hyalinum.*
24. Peridial cells sculptured.
25. Peridial cells subspinulose. *trachysorum.*
25. Peridial cells verrucose.
26. Peridial cells rhomboidal.
27. Aeciospore-wall chestnut-brown. *turkestanicum.*
27. Aeciospore-wall pale-yellow.
28. Aeciospores 21–24 × 24–29 μ. *speciosum.*
28. Aeciospores 21–32 × 24–39 μ. *clavipes.*
26. Peridial cells linear (150–300 μ), much curved or coiled when wet. *fraternum.*
26. Peridial cells oblong (80–130 μ), slightly curved when wet. *clavariiforme* or *gracile.*
25. Peridial cells rugose.
27. Peridium short (0.5 to 1 or 2 mm high).
28. Aeciospores small (17–22 × 19–26 μ).
29. Aeciospore-wall cinnamon-brown, 2.5–3.5 μ. *confusum.*
29. Aeciospore-wall very pale cinnamon-brown 2–2.5 μ. *exterum.*
28. Aeciospores medium-sized (18–27 × 19–35 μ).
30. Aeciospore-wall rugose (2–2.5 μ). *distortum.*
30. Aeciospore-wall verrucose.
31. Aeciospore-wall yellow-brown, 3–5 μ. *sikangense.*
31. Aeciospore-wall light chestnut-brown, 1.5–2 μ. *cunninghamianum.*
31. Aeciospore-wall dark chestnut-brown (2–2.5 μ). * *bermudianum.*
28. Aeciospores large (28–35 × 30–45 μ). *tremelloides.*
27. Peridium more or less elongated (1.5–4 mm high).
32. Aeciospores small (15–19 × 18–25 μ), wall 1.5–2 μ. *globosum.*
32. Aeciospores larger (15–26 × 18–32 μ), wall 2.5–3.5 μ. *nidus-avis.*
27. Peridium further elongated (2–5–6 mm or more).
33. Aeciospores large (18–24 × 19–35 μ). *fusisporum.*
33. Aeciospores small (16–18 × 18–23 μ. *shiraianum.*
33. Aeciospores medium-sized (18–24 × 19–30 μ).
34. Aeciospore-wall cinnamon-brown, 1.5–2.5 μ. *torminali-juniperinum.*
34. Aeciospore-wall chestnut-brown, 2.5–3 μ. *betheli.*
7. Peridium balanoid, rupturing along sides, apex remaining bluntly conical. *fuscum.*

Telial Stage Exclusively Considered

1. Telia foliicolous, or on green stems, with no or slight hypertrophy.
2. Telia causing fasciation of the branches (witches' brooms).
3. Witches' brooms globose, with scale-like leaves, sori bluntly conical. *kernianum.*

---

* This is the only known species which is autoecious; here the aecia are on *Juniperus.*

3. Witches' brooms brush-like, usually with juvenile leaves, sori hemispheric. *nidus-avis.*
2. Telia not causing fasciation.
4. Telia hemispheric.
5. Telia chiefly epiphyllous.
6. Teliospores 2-celled, rarely 3- or 1-celled. *shiraianum.*
6. Teliospores 2-celled.
7. Teliospores with hyaline papillae.
8. Teliospores 35–49 μ long, papillae noticeable. *torminali-juniperinum.*
8. Teliospores 40–55 μ long, papillae large. *davisii.*
7. Teliospores without hyaline papillae. *nipponicum.*
5. Telia arising between the scale-like leaves. *hemisphericum.*
4. Telia musciform. *multiporum.*
4. Telia pulvinate.
9. Telia sometimes causing corniform elongation of leaves. *corniforme.*
9. Telia without deformation of leaves or branches.
10. Teliospores 2–3 or 4-celled, uredinia with paraphysis-like structures. *paraphysatum.*
10. Teliospores 2–5-celled, uredinia unknown. *libocedri.*
10. Teliospores 2-celled.
11. Teliospores pastilliform, squarish or irregular. *formosanum.*
11. Teliospores ellipsoid.
12. Teliospores with wall thicker above. *fraternum.*
12. Teliospores with wall evenly thick.
13. Teliospores small (35–45 μ long). *asiaticum.*
13. Teliospores large (55–80 μ long). *inconspicuum.*
12. Teliospores with hyaline papillae over pores (sori also caulicolous). *cornutum.*
4. Telia tongue-shaped, or conical, teliospores 42–63 μ long. *exiguum.*
4. Telia wedge-shaped, teliospores 37–53 μ long. *betheli* (or *nelsoni*).
4. Telia truncate, teliospores 45–72 μ long. *harknessianum.*
4. Telia unknown; uredia present, teliospores intermixed, 2-celled.
14. Teliospores with papillae; urediospores with 6–8 pores. *gaeumanni.*
14. Teliospores without papillae, urediospores with 2 pores. *nootkatense.*
1. Telia caulicolous, on smaller branches, with little hypertrophy.
15. Teliospores with 1–2 pores in each cell, near the septum. *cunninghamianum.*
15. Teliospores with 4–6 pores, in one or two transverse zones. *taianum.*
1. Telia caulicolous, on witches' brooms.
16. Telia hemispheric, reddish brown.
17. Teliospore-wall cinnamon-brown, often slightly thicker above. *nidus-avis.*
17. Teliospore-wall hyaline to fulvous, uniform. *vauqueliniae.*
16. Telia cylindrical, orange-color.
18. Teliospores 2-celled. *gracile.*
18. Teliospores 2–5-celled. *ellisii.*
1. Telia caulicolous, on galls or gall-like excrescences.
19. Galls rotund, small, telia pulvinate.
20. Telia following aecia, cinnamon-brown, spores 34–50 μ long. *bermudianum.*
20. Telia without aecia, chestnut-brown, teliospores 48–60 μ long. *meridissimum.*
19. Galls subglobose or reniform (in some species telia may also occur on swellings of large branches or trunks).
21. Telia laterally compressed, scattered.
22. Telia irregularly tongue-shaped, often crenate. *cupressi.*
22. Telia wedge-shaped.
23. Teliospores with papillae over the pores. *yamadae.*
23. Teliospores without papillae. *globosum* (or *betheli*).
21. Telia irregularly compressed, often confluent. *nelsoni.*
21. Telia terete.
24. Telia somewhat conic, chestnut-brown.
25. Teliospores with slight hyaline thickenings over the pores. *corniculans.*
25. Teliospores with wall uniformly thick. *floriforme.*
24. Telia subcylindric.
26. Telia cylindric-acuminate, 10–20 mm long, golden-brown. *juniperi-virginianae.*
26. Telia mostly tapering, 6–10 mm long, chestnut-brown. *trachysorum.*

21. Telia pulvinate, crowded, often confluent. *turkestanicum.*
1. Telia caulicolous, on fusiform enlargements.
27. Enlargements slight, mostly on smaller branches.
28. Telia cylindrical, teliospores 2-celled. *padmarense.*
28. Telia applanate, teliospores with pedicels terete.
29. Teliospores with hyaline papillae over the pores. *cornutum.*
29. Teliospores without hyaline papillae.
30. Teliospores with wall thicker above (3–5 μ). *hyalinum.*
30. Teliospores with wall uniform. *amelanchieris.*
28. Telia hemispheric, teliospores with pedicels carotiform. *clavipes.*
28. Telia conic, or laterally compressed. *confusum* or *fuscum.*
27. Enlargements irregularly fusiform, knot-like or gall-like on larger branches.
31. Telia applanate.
32. Teliospores 1–3-celled (40–80 μ long). *miyabei.*
32. Teliospores 2-celled (40–60 μ long). *tremelloides.*
31. Telia wedge-shaped (sori also on galls, and foliicolous). *betheli.*
27. Enlargements gradually fusiform, mostly on woody branches.
33. Telia hemispheric mostly small and definite.
34. Teliospores 2–4-celled. *biseptatum.*
34. Teliospores 2-celled.
35. Pores 2, near the septum, or three in upper cell, 1 apical. *nidus-avis.*
35. Pores usually 4 in a band near the septum, or with 1 or 2 additional in each cell. *atlanticum.*
33. Telia applanate, or pulvinate, usually large and indefinite.
36. Teliospores small, 32–42 μ long. *exterum.*
36. Teliospores large, 45–60 μ long. *minus.*
33. Telia terete, cylindric, or slightly compressed. *clavariiforme.*
33. Telia cristiform, irregularly crenate above. *speciosum.*
33. Telia conic, or laterally compressed.
37. Teliospores 1-celled. *tsingchensis.*
37. Teliospores 2-celled.
38. Teliospores ellipsoid, 42–51 μ long. *confusum* or *fuscum.*
38. Teliospores fusiform, falcate or sigmoid, 46–90 μ long. *fusisporum.*
33. Telia tongue-shaped, often crenate above. *cupressi.*
33. Telia wedge-shaped, often irregular and lacunose.
39. Teliospores medium-sized (42–55 μ long). *effusum.*
39. Teliospores rather large (44–67 μ long). *japonicum.*
1. Telia caulicolous, on larger branches, or main trunk, often with some hypertrophy.
40. Telia pulvinate. *meridissimum.*
40. Telia laterally compressed.
41. Teliospores 1-celled, telia dentiform. *tsingchensis.*
41. Teliospores 2-celled.
42. Telia tongue-shaped, crenate, 4–6 mm high. *cupressi.*
42. Telia wedge-shaped, 3–4 mm high. *betheli.*
42. Telia often irregular and lacunose, 7–10 mm high. *effusum.*
41. Teliospores 2–3-celled, telia cristiform. *speciosum.*

HOST KEYS

Hosts Harboring Aecial Phase

On Amelanchier

1. Aecia aecidioid. *libocedri.*
1. Aecia roestelioid.
2. Peridium retaining tubular form, not much altered by dehiscence.
3. Peridium dehiscent at apex, slightly or not lacerate.
4. Peridial cells verrucose.
5. Side walls of peridial cells verrucose on inner third. *inconspicuum.*
5. Side walls of peridial cells verrucose over entire surface. *harknessianum.*
4. Peridial cells rugose. *amelanchieris.*
4. Peridial cells semi-rugose, with elongated papillae. *nelsoni.*
4. Peridial cells spinulose. *guatemalianum.*

3. Peridium tardily or not at all dehiscent at apex.
6. Peridial cells verrucose with roundish or oval papillae. *corniculans.*
6. Peridial cells verrucose-rugose with irregular papillae. *cupressi.*
6. Peridial cells smooth. *biseptatum.*
2. Peridium more or less tubular, altered by becoming lacerate and spreading.
7. Peridial cells rugose. *nidus-avis.*
7. Peridial cells verrucose.
8. Aeciospore-wall pale yellow. *clavipes.*
8. Aeciospore-wall cinnamon-brown. *gracile* or *clavariiforme.*

On Aronia

1. Aecia roestelioid, peridium retaining tubular or cornute form. *davisii.*
1. Aecia roestelioid, peridium becoming lacerate and spreading.
2. Peridial cells rhomboidal (45–90 μ). *clavipes.*
2. Peridial cells oblong (80–130 μ), slightly curved when wet. *clavariiforme.*
2. Peridial cells linear (150–300 μ), curved or coiled when wet. *fraternum.*

On Chaenomeles

1. Aecia aecidioid. *libocedri.*
1. Aecia roestelioid.
2. Aeciospore-wall pale yellow, 21–32 × 24–39 μ. *clavipes.*
2. Aeciospore-wall cinnamon-brown, 18–26 × 21–30 μ.
3. Peridial cells rugose, with long ridges. *nidus-avis.*
3. Peridial cells verruculose, with long papillae. *asiaticum.*

On Comptonia (See *Myrica*)

On Cormus (See *Sorbus* or *Malus*)

On Cotoneaster

1. Aecia roestelioid, peridium retaining tubular form, peridial cells spinulose, aeciospores verrucose. *nanwutianum.*
1. Aecia roestelioid, peridium becoming lacerate or fimbriate.
2. Peridial cells rugose, aeciospore-wall rugose. *distortum.*
2. Peridial cells rugose, aeciospore-wall verrucose.
3. Aeciospores 19–22 × 19–26 μ. *confusum.*
3. Aeciospores 18–24 × 19–35 μ. *fusisporum.*
2. Peridial cells papillose. *sikangense.*
2. Peridial cells verrucose.
3. Aeciospore-wall cinnamon-brown. *clavariiforme.*
3. Aeciospore-wall pale yellow. *clavipes.*

On Crataegus

1. Aecia aecidioid.
2. Aeciospore-wall uniformly thick.
3. Aeciospores small (12–20 × 14–23 μ). *libocedri.*
3. Aeciospores large (24–29 × 30–32 μ). *magnum.*
2. Aeciospore-wall thicker above (up to 9 μ). *patulum.*
1. Aecia roestelioid.
4. Peridium remaining more or less tubular, somewhat lacerate.
5. Peridial cells tuberculate. *kernianum.*
5. Peridial cells strongly spinulose. *exiguum.*
5. Peridial cells verrucose-rugose. *malyi.*
5. Peridial cells rugose. *globosum.*
4. Peridium losing tubular form, deeply lacerate.
6. Peridial cells sculptured.
7. Peridial cells verrucose.
8. Aeciospore-wall pale yellow. *clavipes.*
8. Aeciospore-wall cinnamon-brown. *clavariiforme* or *gracile.*
7. Peridial cells rugose.
9. Inner and side walls moderately rugose, rather thick (3–6 μ). *betheli.*
9. Inner and side walls strongly rugose, thick (5–7 μ). *confusum.*

7. Peridial cells subspinulose. *trachysorum.*
6. Peridial cells smooth. *hyalinum.*
4. Peridium strongly revolute. *floriforme.*

On Cydonia

1. Aecia aecidioid. *libocedri.*
1. Aecia roestelioid.
2. Peridium rupturing at apex and more or less along the sides.
3. Peridial cells verruculose with long papillae. *asiaticum.*
3. Peridial cells tuberculate with blunt papillae. *kernianum.*
2. Peridium losing tubular form, becoming lacerate and spreading.
4. Peridial cells verrucose.
5. Aeciospore-wall pale yellow, coarsely verrucose. *clavipes.*
5. Aeciospore-wall cinnamon-brown, moderately verrucose. *clavariiforme* or *gracile.*
4. Peridial cells rugose, linear-rhomboid; aeciospores medium-sized (18–28 μ).
6. Inner and side walls strongly rugose with ridges of varying length. *confusum.*
6. Inner and side walls rugose with long narrow ridges interspersed with roundish papillae. *nidus-avis.*
4. Peridial cells rugose, rhomboid; aeciospores large (28–45 μ). *tremelloides.*

On Fendlera

Aecia roestelioid, peridium tubular, peridial cells verrucose, aeciospores 21–24 × 24–29 μ. *speciosum.*

On Gillenia

Aecia roestelioid, peridium soon lacerate and spreading, peridial cells rugose, aeciospores 17–21 × 21–26 μ. *exterum.*

On Heteromeles

Aecia roestelioid, peridium not spreading much, peridial cells spinulose. *exiguum.*

On Juniperus

Aecia roestelioid, on galls, peridium lacerate, aeciospores 16–19 × 19–29 μ. *bermudianum.*

On Macromeles (See *Malus*)

On Malus

1. Aecia aecidioid.
2. Aeciospores small (18–20 × 14–23 μ). *libocedri.*
2. Aeciospores large (23–27 × 27–39 μ). *nootkatense.*
1. Aecia roestelioid.
3. Peridium conical or subcylindrical, dehiscent only at apex 1–1.5 mm high. *hemisphericum.*
3. Peridium cornute, retaining shape, 3–5 mm high. *cornutum.*
3. Peridium tubular, spreading or more or less erect after rupturing.
4. Peridial cells tuberculate. *yamadae.*
4. Peridial cells verrucose.
5. Aeciospores 21–32 × 24–39 μ, wall yellow. *clavipes.*
5. Aeciospores 18–24 diam., wall cinnamon-brown. *miyabei.*
4. Peridial cells spinulose. *leve.*
4. Peridial cells rugose.
6. Aeciospores small (15–19 × 18–25 μ), wall thin (1–2 μ). *globosum.*
6. Aeciospores medium (18–23 × 23–38 μ), wall medium (1.5–2.5 μ). *fenzelianum.*
6. Aeciospores large (28–35 × 30–45 μ), wall thick (3–5 μ). *tremelloides.*
3. Peridium strongly revolute ofter dehiscence. *juniperi-virginianae.*

On Mespilus

Aecia roestelioid, becoming lacerate, peridial cells rugose. *confusum.*

On Micromeles (See *Sorbus*)

On Myrica

Aecia aecidioid, peridial cells with thick outer wall, smooth, thinner inner wall, verrucose, spores 24–30 × 27–34 μ. *ellisii.*

On Peraphyllum

1. Aecia roestelioid.
   2. Peridium rupturing at apex and along the sides, peridial cells semi-rugose. *nelsoni.*
   2. Peridium rupturing at apex, not lacerate along sides, peridial cells verrucose. *inconspicuum.*

On Philadelphus

Aecia roestelioid, peridium tubular, peridial cells verrucose. *speciosum.*

On Photinia (*Pourthiaea*)

1. Aecia roestelioid.
   2. Peridial cells subspinulose. *japonicum.*
   2. Peridial cells verruculose. *asiaticum.*
1. Aecia cupulate.
   3. Aeciospores medium-sized (18–23 × 23–30 μ), wall 2–3 μ. *wenshanense.*
   3. Aeciospores small (17–19 × 19–24 μ), wall 1 μ (*Aecidium*). *pourthiaeae.*

On Pyrus

1. Aecia aecidioid.
   2. Aeciospores small (18–20 × 14–23 μ). *libocedri.*
   2. Aeciospores large (23–27 × 27–39 μ). *nootkatense.*
1. Aecia roestelioid.
   3. Peridium losing tubular form, becoming lacerate and spreading.
      4. Peridial cells rhomboid in side-view.
         5. Peridial cells rugose, aeciospores brown. *cunninghamianum.*
         5. Peridial cells verrucose, aeciospores yellow. *clavipes.*
      4. Peridial cells linear-rhomboid in side-view.
         6. Peridial cells verrucose. *clavariiforme.*
         6. Peridial cells rugose.
            7. Inner and side walls moderately rugose, medium 3–5 μ. *globosum.*
            7. Inner and side walls strongly rugose, thick, 5–7 μ. *confusum.*
   3. Peridium retaining tubular form, rupturing at apex.
      8. Peridium cylindrical, long (3–6 mm). *asiaticum.*
      8. Peridium cylindrical, medium (2–5 mm).
         9. Peridial cells tuberculate. *kernianum.*
         9. Peridial cells rugose or parallel-striated. *shiraianum.*
   3. Peridium balanoid, rupturing along sides, apex remaining bluntly conic. *fuscum.*

On Sorbus

1. Aecia aecidioid.
   2. Aeciospores small (18–20 × 14–23 μ). *libocedri.*
   2. Aeciospores large (23–27 × 27–39 μ). *nootkatense.*
1. Aecia roestelioid.
   3. Peridium retaining tubular form, dehiscent at apex.
      4. Peridial cells rugose. *cornutum.*
      4. Peridial cells verrucose. *miyabei.*
      4. Peridial cells verruculose. *nipponicum.*
   3. Peridium losing tubular form becoming lacerate or spreading.
      5. Peridial cells rugose.
         6. Peridia elongated (1.5–4 mm high).
            7. Aeciospores small (15–19 × 18–25 μ), wall 1.5–2 μ. *globosum.*
            7. Aeciospores medium-sized (15–26 × 18–32 μ), wall 2–3.5 μ. *nidus-avis.*
         6. Peridia elongated (2–5 or 6 mm or more).
            8. Aeciospores very large (28–35 × 30–45 μ), wall 3–5 μ. *tremelloides.*
            8. Aeciospores small (18–24 × 24–27 μ), wall 1.5–2.5 μ. *torminali-juniperinum.*
      5. Peridial cells verrucose. *turkestanicum.*

On Vauquelinia *vauqueliniae.*

Hosts Harboring Telial Phase

On Chamaecyparis

1. Telia foliicolous, without hypertrophy, teliospores 2-celled.
  2. Teliospores with medium cinnamon-brown walls, thicker above, 3–5 μ. *fraternum.*
  2. Teliospores with thin, lemon-yellow walls, uniform, 1–1.5 μ. *nootkatense.*
1. Telia caulicolous, causing more or less hypertrophy.
  3. Enlargements of stems slight or gradually fusiform.
    4. Telia pulvinate, teliospores 2-celled. *hyalinum.*
    4. Telia hemispheric, teliospores 2–4-celled. *biseptatum.*
    4. Telia terete, slender, teliospores 2–5-celled. *ellisii.*
  3. Enlargements irregular, knotty, teliospores 1–3-celled. *miyabei.*
1. Telia often causing fasciation of the branches. *ellisii.*

On Cupressus

1. Telia caulicolous, on smaller branches only, with little hypertrophy.
  2. Teliospores with 1–2 pores in each cell, near the septum. *cunninghamianum.*
  2. Teliospores with 4–6 or more pores, in one transverse zone near the septum or in two zones, those near apex or base only two in number. *taianum.*
1. Telia caulicolous, on smaller branches, with fusiform swellings. *minus.*
1. Telia caulicolous, extending to larger branches and main trunk, with hypertrophy.
  3. Swellings fusiform to subglobose galls, telia becoming tongue-shaped and irregular, teliospores 2-celled, 16–27 × 30–60 μ. *cupressi.*
  3. Swellings at first rotund galls, later fusiform swellings, telia pulvinate, teliospores 2-celled, 24–28 × 48–60 μ. *meridissimum.*
  3. Swellings fusoid, on branches of various ages, telia laterally compressed, teliospores 1-celled, 24–31 × 34–59 μ. *tsingchensis.*

On Juniperus sect. Oxycedrus

1. Telia foliicolous, or on green stem, not causing hypertrophy of the stem.
  2. Telia hemispheric or depressed-globose.
    3. Teliospores with hyaline papillae over the pores.
      4. Teliospores 35–49 μ long, papillae noticeable. *torminali-juniperinum.*
      4. Teliospores 40–55 μ long, papillae large. *davisii.*
    3. Teliospores without hyaline papillae. *shiraianum.*
  2. Telia pulvinate or applanate.
    5. Teliospores with hyaline papillae. *cornutum.*
    5. Teliospores without hyaline papillae. *corniforme.*
1. Telia caulicolous, causing witches' brooms. *gracile.*
1. Telia on twigs or branches, causing more or less hypertrophy.
  6. Telia hemispheric, teliospores with carotiform pedicels. *clavipes.*
  6. Telia applanate or pulvinate, teliospores with terete pedicels.
    7. Telia on smaller branches with slight hypertrophy.
      8. Teliospores with hyaline papillae. *cornutum.*
      8. Teliospores without hyaline papillae. *amelanchieris.*
    7. Telia on larger branches with hemispheric or gall-like swellings. *tremelloides.*
    6. Telia terete. *clavariiforme.*
  6. Telia conic or laterally compressed, higher than wide. *confusum* or *fuscum.*
1. Telia unknown; uredia present, teliospores intermixed, teliospores 2-celled. *gaeumanni.*

On Juniperus sect. Sabina

1. Telia foliicolous, or on green stems, without hypertrophy.
  2. Telia causing fasciation of branches (witches' brooms).
    3. Telia hemispheric, teliospores medium-sized (37–52 μ long). *nidus-avis.*
    3. Telia bluntly conical, teliospores large (45–74 μ long). *kernianum.*
  2. Telia not causing fasciation of branches (or slight).
    4. Telia arising between the leaves.
      5. Pedicels of teliospores carotiform. *inconspicuum.*
      5. Pedicels of teliospores terete.
        6. Pores 2 in each cell near septum, or only one in upper cell.
          7. Teliospores subglobose (25–30 × 30–35 μ). *hemisphericum.*

7. Teliospores ellipsoid (17–27 × 37–65 μ). *betheli* (or *nelsoni*).
6. Pores 5–7 in each cell, scattered. *multiporum.*
4. Telia borne on the leaves.
8. Telia pulvinate, or hemispheric.
9. Teliospores ellipsoid (15–27 × 36–45 μ). *asiaticum* (or *nipponicum*).
9. Teliospores pastilliform (20–39 × 36–75 μ). *formosanum.*
8. Telia tongue-shaped or truncate.
10. Teliospores small (18–23 × 45–55 μ). *exiguum.*
10. Teliospores large (16–22 × 45–72 μ). *harknessianum.*
1. Telia caulicolous, often causing witches' broom effect.
11. Telia cylindrical, teliospores 47–86 μ long. *gracile.*
11. Telia hemispheric, teliospores 37–52 μ long. *nidus-avis.*
11. Telia hemispheric, teliospores 52–65 μ long. *vauqueliniae.*
1. Telia caulicolous, causing more or less hypertrophy.
12. Telia on galls or gall-like excrescences.
13. Galls irregular, often breaking forth in succession along fusiform swellings, sometimes isolated. *betheli.*
13. Galls globoid, subgloboid, or reniform.
14. Telia laterally compressed.
15. Telia wedge-shaped.
16. Teliospores with papillae over pores. *yamadae.*
16. Teliospores without papillae. *globosum.*
15. Telia irregularly compressed, often confluent. *nelsoni.*
14. Telia terete, somewhat conic, chestnut-brown.
17. Teliospores with hyaline thickening over pores. *corniculans.*
17. Teliospores without hyaline thickenings. *floriforme.*
14. Telia subcylindric.
18. Telia cylindric-acuminate 10–20 mm long, golden-brown. *juniperi-virginianae.*
18. Telia mostly tapering, 6–10 mm long, chestnut-brown. *trachysorum.*
14. Telia pulvinate.
19. Teliospores small (18–25 × 34–50 μ), following aecia. *bermudianum.*
19. Teliospores medium (23–29 × 45–58 μ), without aecia. *turkestanicum.*
12. Telia on fusiform swellings (sometimes on large branches or trunks).
20. Telia hemispheric, applanate, or pulvinate.
21. Pedicels of teliospores terete.
22. Pores 1, near the septum in lower cell, apical in upper cell. *exterum.*
22. Pores 2, near the septum, or 3 in upper cell with 1 apical. *nidus-avis.*
22. Pores 4 or more, near the septum, rarely or 1 or 2 additional above and below. *atlanticum.*
21. Pedicels of teliospores carotiform. *clavipes.*
20. Telia cristiform, or crenate. *speciosum.*
20. Telia wedge-shaped, often irregular and lacunose.
23. Teliospores medium-sized (42–55 μ long). *effusum* (or *betheli*).
23. Teliospores large (57–66 μ long). *japonicum.*
20. Telia conic or often laterally compressed, higher than wide.
24. Teliospores ellipsoid (30–60 μ long). *fuscum* (or *confusum*).
24. Teliospores fusiform, falcate, or sigmoid (46–90 μ long). *fusisporum.*
20. Telia cylindrical, teliospores very long (up to 200 μ). *padmarense.*

On Libocedrus

1. Telia foliicolous, pulvinate, teliospores 2–4–5-celled.
2. Uredial stage present, with numerous, conspicuous paraphysis-like structures. *paraphysatum.*
2. Uredial stage unknown. *libocedri.*

LEGENDS TO FIGURES

FIG. 1–4. *Gymnosporangium*, peridia of aecia showing variations in form and dehiscence (all somewhat enlarged). FIG. 1. Aecia cupulate, *G. libocedri* on *Crataegus*. FIG. 2. Aecia cornute, *G. cornutum* on *Sorbus*. FIG. 3. Aecia lacerate and spreading, *G. confusum* on *Crataegus*. FIG. 4. Aecia balanoid, *G. fuscum* on *Pyrus* (photo by V. Grasso).

FIG. 5–16. *Gymnosporangium*. FIG. 5–8. Variations in peridial cells of aecia (after Kern). FIG. 5. Verrucose (in part), *G. inconspicuum*. FIG. 6. Rugose, *G. nidus-avis*. FIG. 7. Spinulose, *G. exiguum*. FIG. 8. Smooth, *G. hyalinum*. FIG. 9–16. Variations in form of teliospores and uredospores. FIG. 9. *G. gaeumanni*. a. Two uredospores with thin walls; one with thick wall, amphispore. b. Two teliospores (after Zogg). FIG. 10. *G. tsingchensis*, teliospore with one cell. FIG. 11. *G. biseptatum*, teliospore with several cells (after Kern). FIG. 12. *G. clavipes*, teliospore with carotiform pedicel (after Kern). FIG. 13. *G. ellisii*, teliospore with linear-fusiform shape, several cells (after Kern). FIG. 14. *G. davisii*, teliospore with hyaline papillae over the pores (after Kern). FIG. 15. *G. multiporum*, teliospore with several scattered pores (after Bethel). FIG. 16. *G. clavariiforme*, teliospores with lanceolate shape, two cells (after Kern).

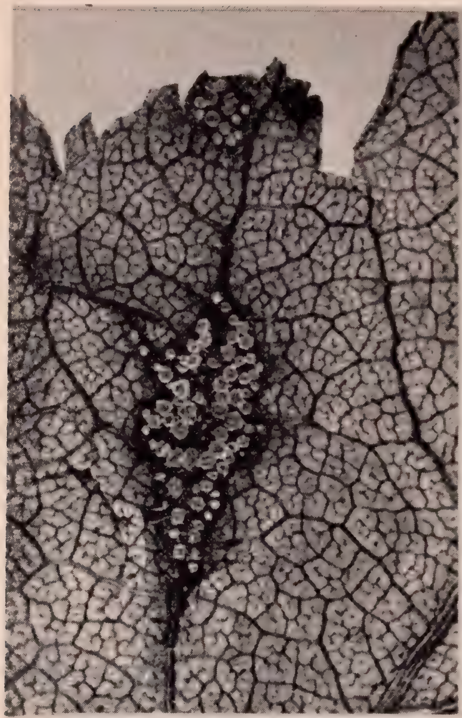
FIG. 17–24. *Gymnosporangium globosum*, aecial and telial stages. FIG. 17. Several groups of aecia with tubular peridia, becoming lacerate above, on leaf of *Crataegus*. FIG. 18. A peridium. FIG. 19. A straight, rugose peridial cell. FIG. 20. An aeciospore. FIG. 21. Photograph of a globose gall on *Juniperus*. FIG. 22. Sketch of gall showing scars of telia of previous season. FIG. 23. A wedge-shaped telium. FIG. 24. A teliospore.

FIG. 25–32. *Gymnosporangium juniperi-virginianae*, aecial and telial stages. FIG. 25. Annular group of aecia with fimbriate and revolute peridia on leaf of *Malus* (after Kern). FIG. 26. Single peridium from above. FIG. 27. Aeciospore showing several pores. FIG. 28. A curved rugose peridial cell. FIG. 29. Subgloboid or reniform galls on *Juniperus* (after Kern). FIG. 30. Sketch of a gall showing collar-like swelling at base of each telium. FIG. 31. A cylindric-acuminate telium. FIG. 32. A teliospore.

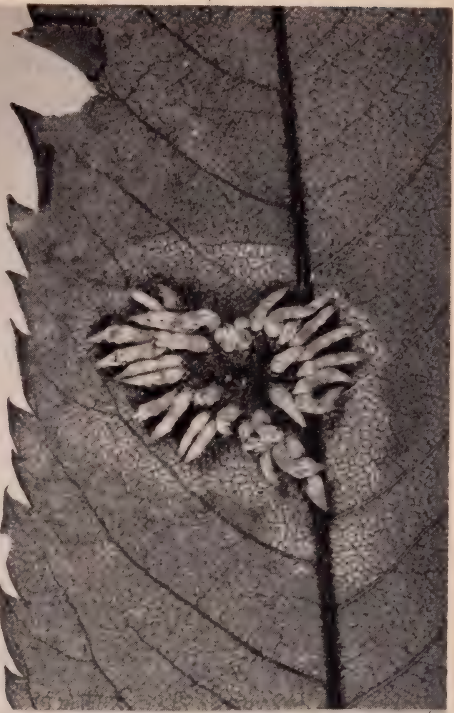
FIG. 33–37. *Gymnosporangium*, showing varied distribution of sori—four telia, one aecium (after Kern). FIG. 33. Telia foliicolous, pulvinate, *G. libocedri*. FIG. 34. Telia foliicolous, hemispheric, *G. davisii*. FIG. 35. Telia on a gall, irregularly compressed, often confluent, *G. nelsoni*. FIG. 36. Aecia on a gall, cylindric, *G. bermudianum*. FIG. 37. Telia on gall-like excrescences, terete, somewhat conic, *G. corniculans*.

FIG. 38–41. *Gymnosporangium*, effects on hosts produced by the telial stages. FIG. 38. Telia causing fasciation of the branches, *G. kernianum* (after Kern). FIG. 39. Telia on fusiform enlargement, applanate, *G. exterum* (after Kern). FIG. 40. Telia on slight fusiform swellings, pulvinate, *G. cornutum* (after Oersted). FIG. 41. Telia on irregular enlargement, applanate, *G. tremelloides* (after Kern).

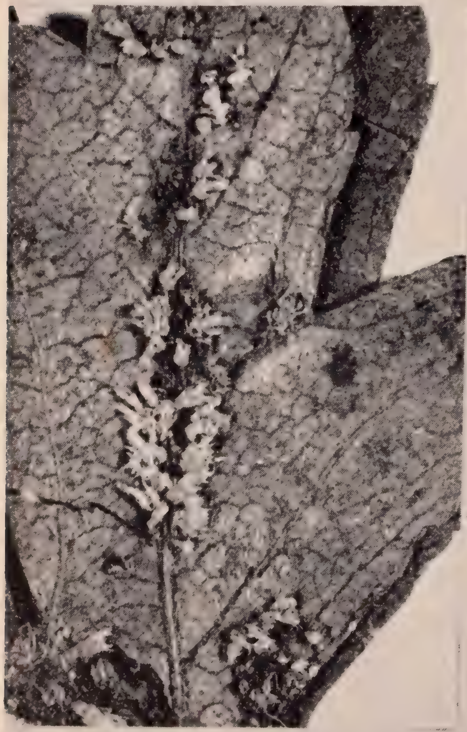
FIG. 42, 43. *Gymnosporangium clavariiforme*, telia on gradual fusiform enlargements, terete or slightly compressed. FIG. 42. Telia mature but dry. FIG. 43. Telia after swelling in moisture.



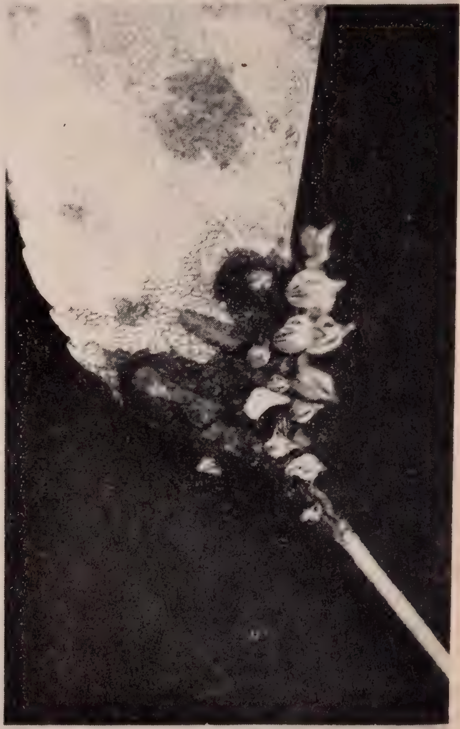
1



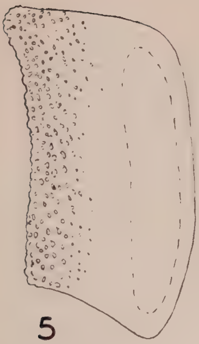
2



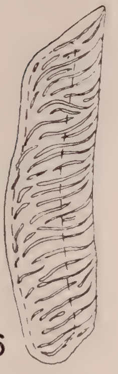
3



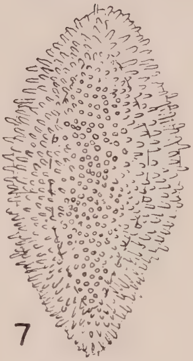
4



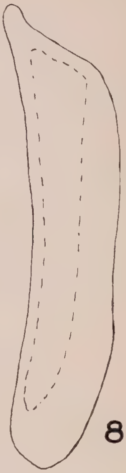
5



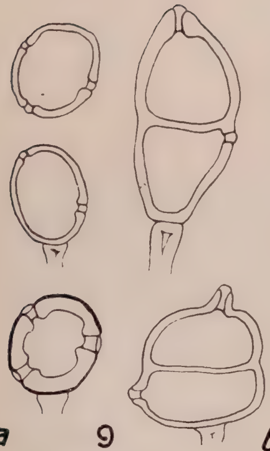
6



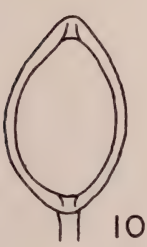
7



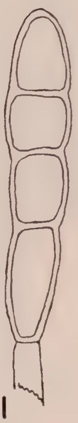
8



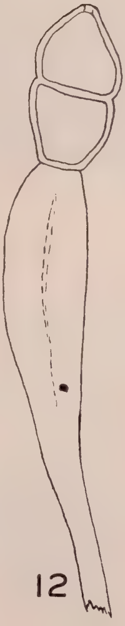
9



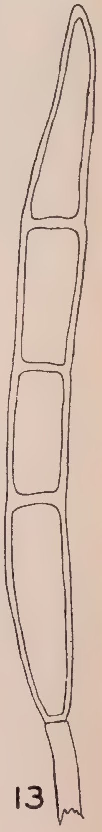
10



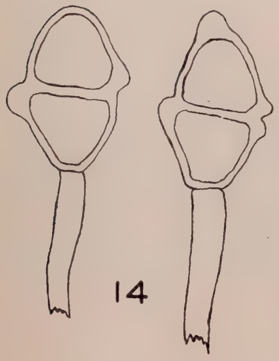
11



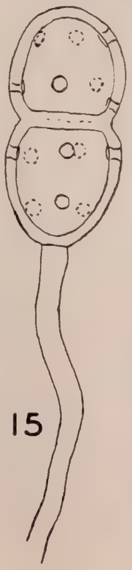
12



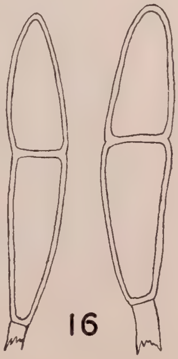
13



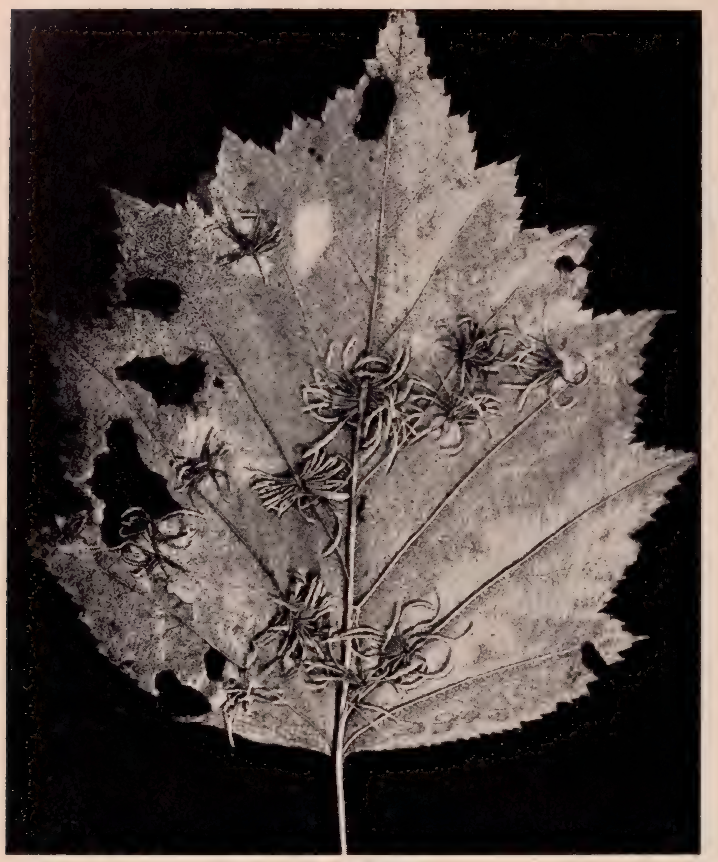
14



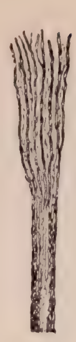
15



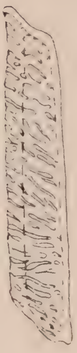
16



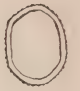
17



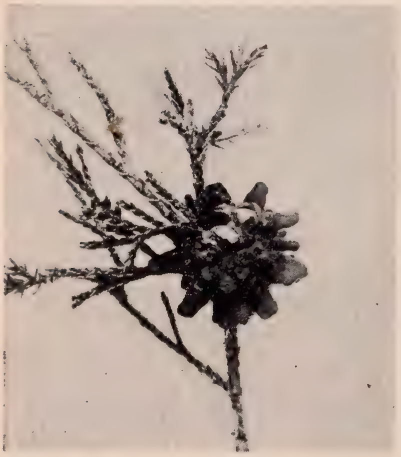
18



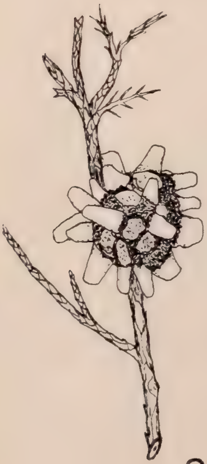
19



20

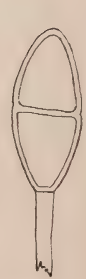


21

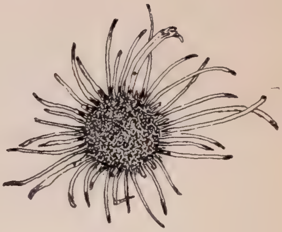


22

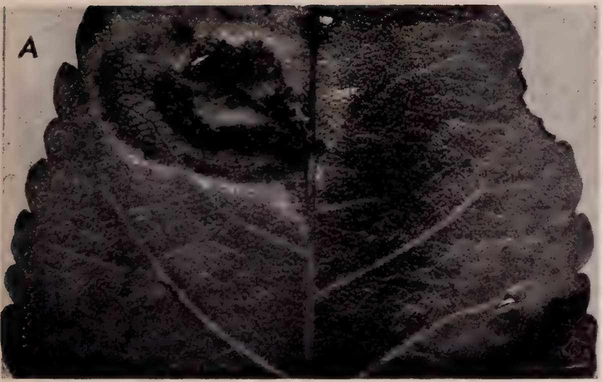
23



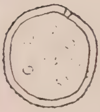
24



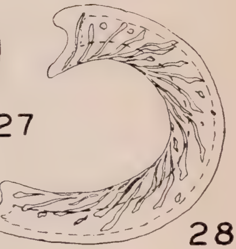
26



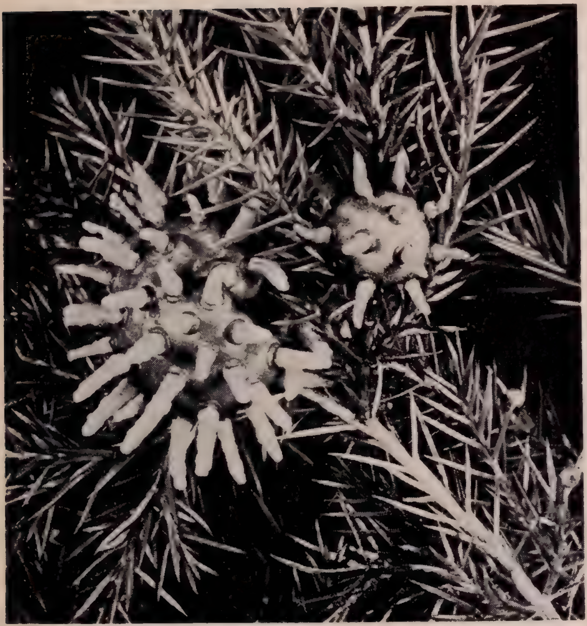
25



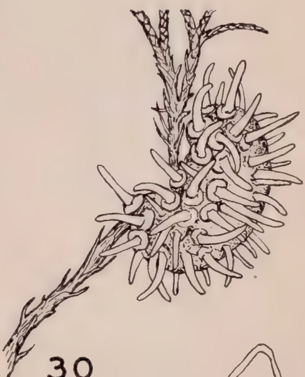
27



28

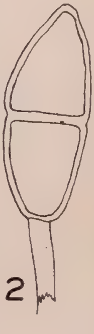


29

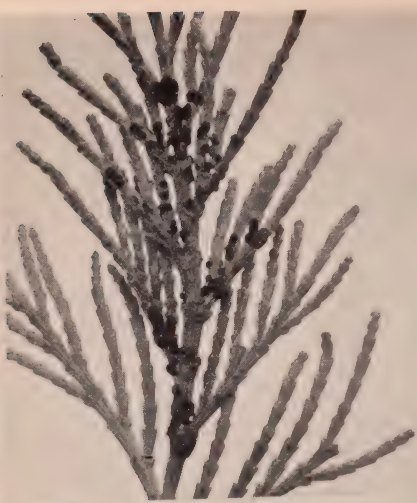


30

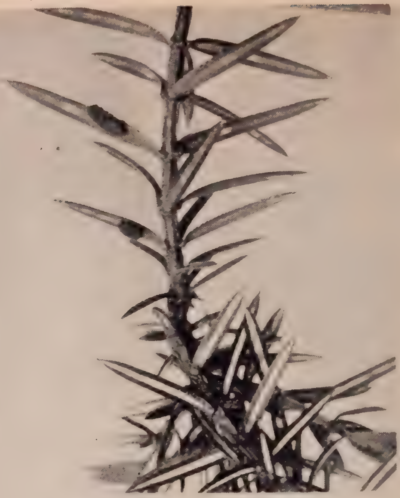
31



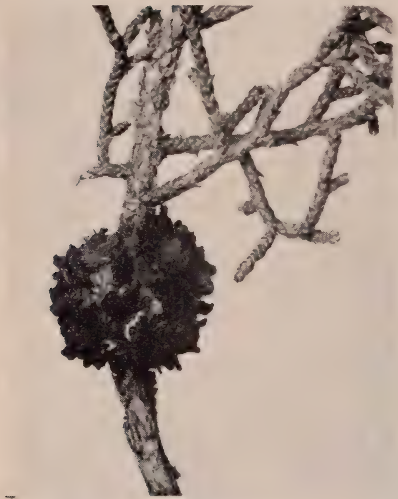
32



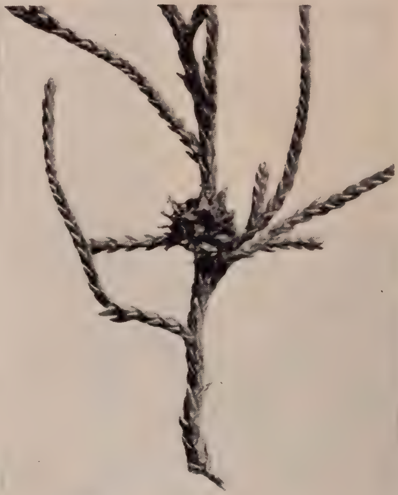
33



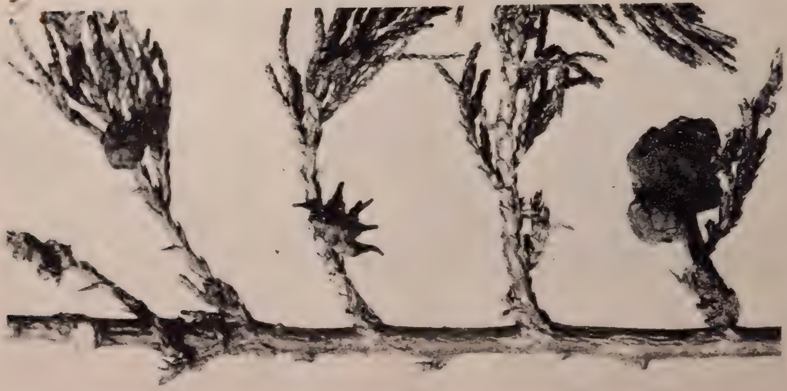
34



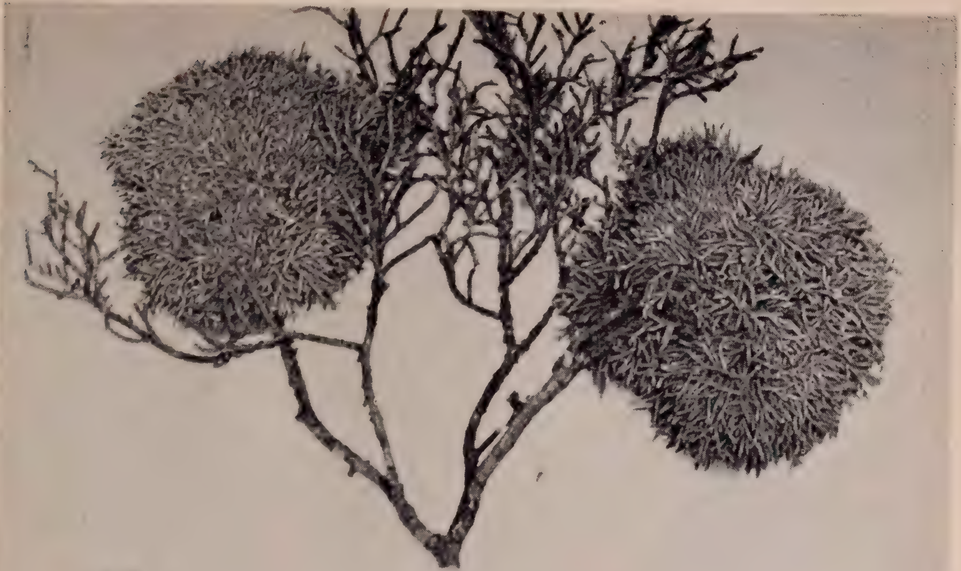
35



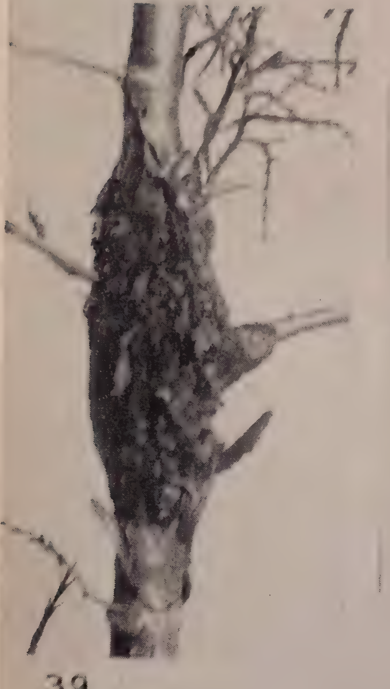
36



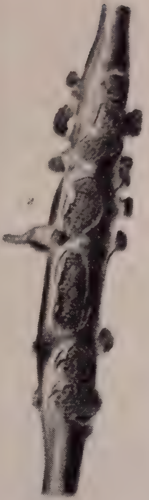
37



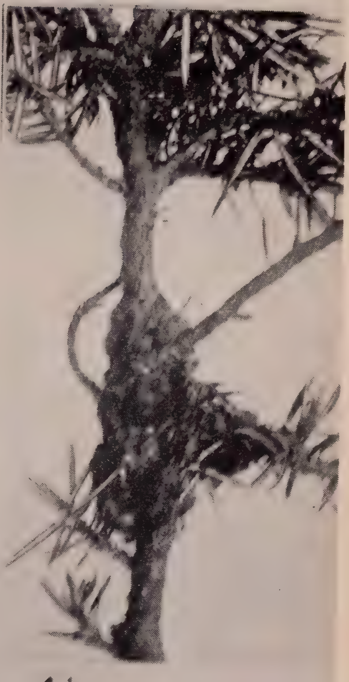
38



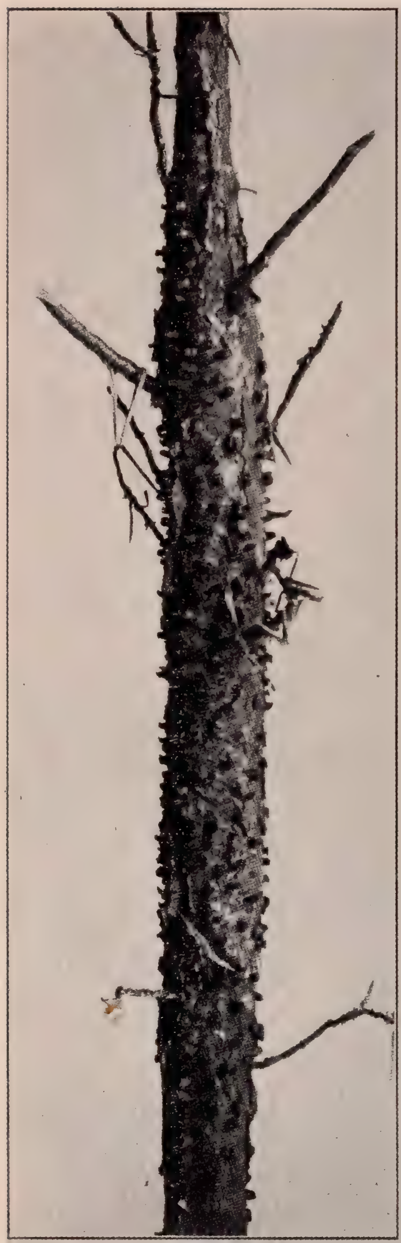
39



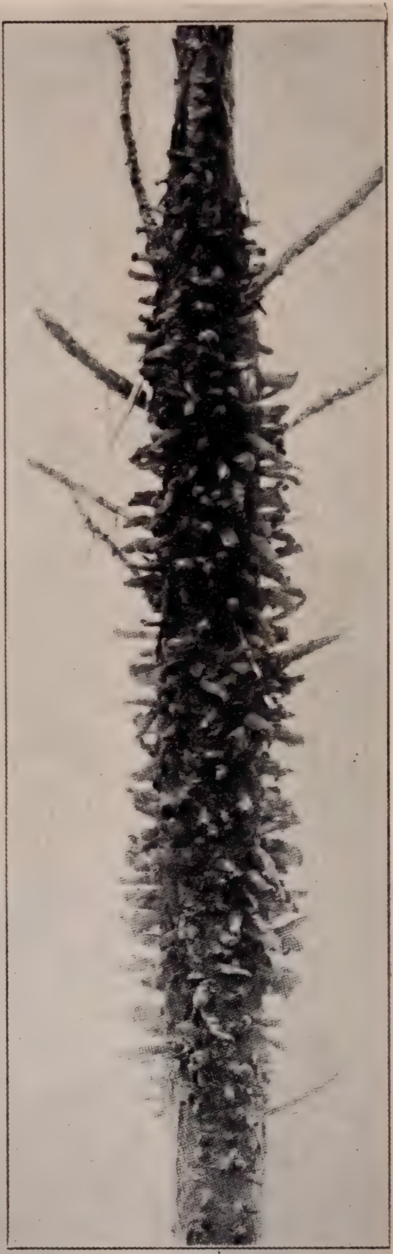
40



41



42



43

PUBLICATIONS OF

THE NEW YORK BOTANICAL GARDEN

Subscriptions for the **MEMOIRS**, and for other serials published by The New York Botanical Garden, should be addressed to: The New York Botanical Garden, Bronx Park, Bronx, New York 10458.

Back issues and reprints of the **MEMOIRS**, and of other serials published by The New York Botanical Garden, are handled exclusively by Stechert-Hafner, 31 East 10th Street, New York, N. Y. 10003. A descriptive catalog of botanical literature, including all serials and books published by The New York Botanical Garden, may be obtained free by writing to Stechert-Hafner.

Serials

Addisonia, colored plates of flowering plants accompanied by nontechnical descriptions; 8 plates to a part, 4 parts to a volume. Published one part annually. Subscription $10.00 per volume.

Brittonia, published quarterly for the American Society of Plant Taxonomists. Subscription $7.50 per volume.

Economic Botany, official organ of the Society for Economic Botany, published quarterly. Subscription $8.00 a year.

Memoirs of The New York Botanical Garden, scientific papers by members of the staff and collaborators; issued irregularly. Subscription $10.00 per volume.

Mycologia, official organ of the Mycological Society of America, published bimonthly. Subscription $10.00 a year.

North American Flora, descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. 100 parts; now in 2nd series. Prices of parts on request.

The Botanical Review, published quarterly, critical botanical essays. Subscription $7.50 a year for United States and Canada; $8.00 foreign.

The Garden Journal, nontechnical articles on botanical, horticultural, and kindred subjects, published bimonthly. Subscription $3.00 a year; $3.50 foreign.

Bound by
DESS. & TALA

New York Botanical Garden Library
3 5185 00214 9332